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Eclipse3 Series User's Manual

Graphics Boards for PMC, PCI and CompactPCI Compatible Computers

Rastergraf

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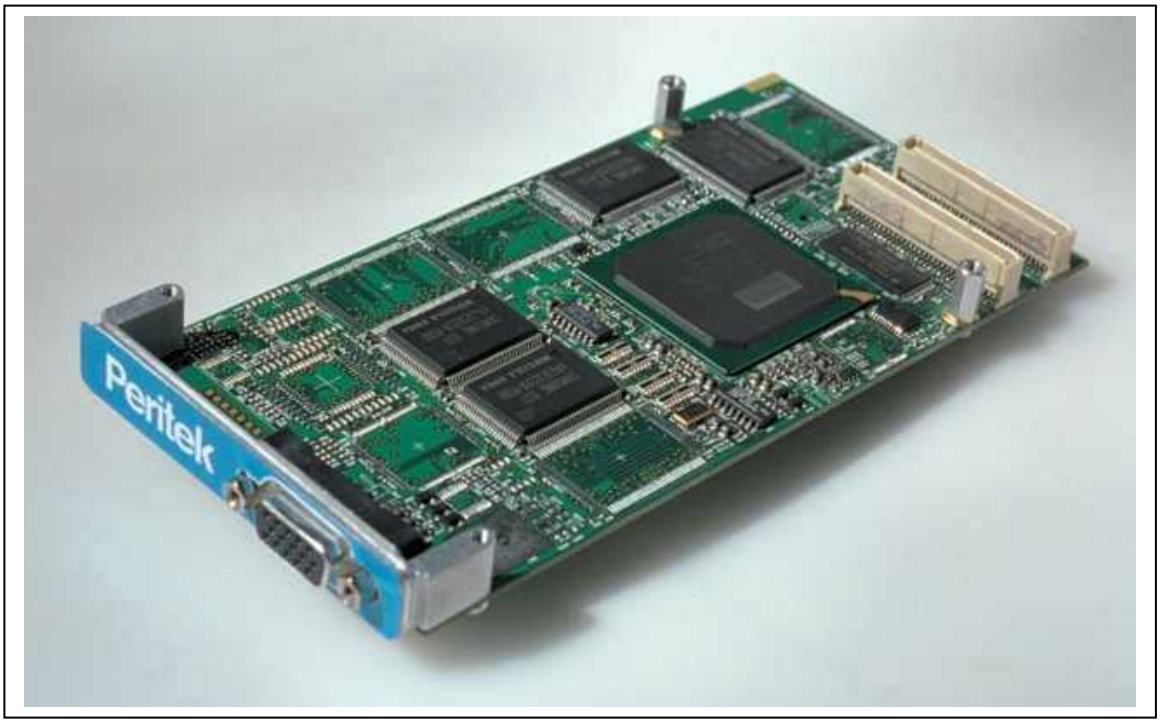

Introduction

This manual provides information about how to configure, install, and program the Rastergraf Eclipse3 128-bit graphics display controllers. Software support is available for Solaris, Linux, VxWorks, LynxOS, and Windows 2000 and XP. They are available for PMC PCI, and CompactPCI compatible computers.

This manual is broken down into four chapters:

Chapter 1: General Information
Chapter 2: Installing the Graphics Board
Chapter 3: Programming Devices and Memories
Chapter 4: Troubleshooting

Chapter 1 provides background material about the graphics boards. Understanding the information in the chapter, however, is not essential for the hardware or software installation. If you want to perform the installation as quickly as possible, start with Chapter 2. If you have problems installing the hardware, refer to Chapter 4 for help.

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Getting Help

This installation manual gives specific steps to take to install your Rastergraf graphics board. There are, however, variables specific to your computer configuration and monitor that this manual cannot address. Normally, the default values given in this manual will work. If you have trouble installing or configuring your system, first read Chapter 4, "Troubleshooting". If this information does not enable you to solve your problems, do one of the following:

1) call Rastergraf technical support at (541) 923-5530
2) fax your questions to (541) 923-6475
3) send E-mail to support@rastergraf.com.

If your problem is monitor related, Rastergraf technical support will need detailed information about your monitor.

Board Revisions

This manual applies to the following board revision levels:

Eclipse3PMC Fab Rev 1.2A

Eclipse3CPCI Fab Rev 1

Eclipse3PCI Fab Rev 0

Manual Revisions

Revision 1.0	March 19, 2001	First released version
Revision 1.1	March 25, 2001	Revisions
Revision 1.2	June 15, 2001	Minor revisions
Revision 1.3	June 25, 2001	Minor revisions
Revision 1.4	May 14, 2002	Updates for PMC 1.2
Revision 1.5	May 17, 2002	A few more changes
Revision 1.6	May 17, 2002	Release
Revision 1.7	May 17, 2002	Minor revisions
Revision 1.8	August 22, 2002	Noted Fab Rev 1.2a change for M66EN
Revision 2.0	February 11, 2008	Created Rastergraf version. Many detail changes

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Notices

Information contained in this manual is disclosed in confidence and may not be duplicated in full or in part by any person without prior approval of Rastergraf. Its sole purpose is to provide the user with adequately detailed documentation to effectively install and operate the equipment supplied. The use of this document for any other purpose is specifically prohibited.

The information in this document is subject to change without notice. The specifications of the Eclipse3 graphics boards and other components described in this manual are subject to change without notice. Although it regrets them, Rastergraf assumes no responsibility for any errors or omissions that may occur in this manual. Customers are advised to verify all information contained in this document.

The electronic equipment described herein generates, uses, and may radiate radio frequency energy, which can cause radio interference. Rastergraf assumes no liability for any damages caused by such interference.

Rastergraf products are **not** authorized for ***any*** use as critical components in flight safety or life support equipment without the written consent of the president of Rastergraf, Inc.

These products have been designed to operate in user-provided PMC, CPCI, and PCI-compatible computers. Connection of incompatible hardware is likely to cause serious damage. Rastergraf assumes no liability for any damages caused by such incompatibility.

Rastergraf assumes no responsibility for the use or reliability of software or hardware that is not supplied by Rastergraf, or which has not been installed in accordance with this manual.

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Conventions Used In This Manual

The following list summarizes the conventions used throughout this manual.

`Code fragments`	Code fragments, file, directory or path names and user/computer dialogs in the manual are presented in the `courier` typeface.
Commands or **program names**	Commands, or the names of executable programs, except those in code fragments, are in bold.
System prompts and commands	Commands in code fragments are preceded by the system prompt, a percentage sign (%), the standard prompt in UNIX's C shell, or the hash-mark (#), the standard UNIX prompt for the Super-User.
Keyboard usage	**<CR>** stands for the key on your keyboard labeled "RETURN" or "ENTER"

Note	Note boxes contain information either specific to one or more platforms, or interesting, background information that is not essential to the installation.

Caution	Caution boxes warn you about actions that can cause damage to your computer or its software.

Warning!	Warning! boxes warn you about actions that can cause bodily or emotional harm.

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Chapter 1
General Information

1.1 Introduction

The Rastergraf Eclipse3 is part of Rastergraf ’s broad line of graphics modules for use in PMC, PCI, VME, and CompactPCI computers.

For information about all of Rastergraf ’s products, please contact Rastergraf Worldwide Sales at (541) 923-5530 or consult Rastergraf ’s web page at http://www.rastergraf.com.

The Eclipse3 uses a Rastergraf Borealis 2D/3D 128-bit graphics accelerator. It features UVGA compatibility, an OpenGL pipeline, and can address up to 32 MB of on-board SGRAM.

The Eclipse3 boards are available with either a standard VGA connector or a DVI-I connector. When provided with the DVI-I connector, a DVI transmitter provides 24-bit digital output encoded onto four TMDS differential signal pairs.

The Eclipse3 boards can function as the system VGA controller and includes an on-board flash PROM loaded with VGA BIOS for Windows and Linux and/or OpenBoot FCode for Sun Solaris.

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1.2 Functional Description

As an aid to understanding the Eclipse3, a block diagram is provided at the end of this section. The feature set includes:

- 128-bit Rastergraf Borealis 2D/3D Graphics Controller
- 33/66 MHz 32-bit PCI bus
- Embedded VGA controller
- Quad-Image BIOS supports FCode, VGA, DVI, and Sync-On-Green
- Up to 1920 x 1200 displayable analog resolution
- Up to 1280 x 1024 displayable digital (DVI) resolution
- Up to 32 MB high speed SGRAM supports multiple display pages
- Hardware pan, zoom, and scroll and bitmapped cursors
- Optional DVI Digital Output
- Non-interlaced, high refresh rate, and Sync-On-Green displays
- Optional three status LEDs (controlled by host software)
- Optional 2 Kb serial EEPROM
- Optional LM75 thermal sensor
- Optional 3.3V Regulator for systems without local 3.3V
- User selectable Sync-On-Green boot mode
- Two connector choices:
- Standard HD-15 VGA connector for RGBHV (only)
- DVI-I connector with RGBHV and DVI digital ports
- Three different PCB form factors:
- PMC single-wide module
- PCI (short)
- CompactPCI 3U board with either 3U or 6U faceplate
- Optional rear-panel I/O configuration for CompactPCI
- Ruggedized version (conformal coating and extended temperature)
- SDL Graphics Subroutine Package
- Sun/Solaris DDX 2D and 3D X Window System Servers
- Xfree86 Version 4.2 X Window System Server
- Windows 2K/XP drivers

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1.2.1 Borealis Graphics Controller

The Rastergraf Borealis 2D/3D graphics controller chip is a 128-bit graphics controller with accelerated 2D and 3D patterned lines and shaded triangles, Z buffer, and 3D volume clipping. It provides a high performance 33/66 MHz PCI 2.1 compliant interface with no additional external logic required.

Key Borealis Device Features

- 33/66 MHz PCI Interface
- PCI Bus Master Event Notification
- 100 MHz SGRAM Memory Controller with Block Writes
- Texture Mapping Capabilities
- Perspective Correction
- Point Sampling, Bilinear and Trilinear filtering
- Full Level-of-Detail Per-Pixel MIP Mapping
- Separate Texture Mipmapping Minification and Magnification filtering
- Full OpenGL Texture Decal, Blend and Modulation Modes
- RGB Modulation Lighting Effects
- Support Palletized Textures: 1, 2, 4 and 8 bit
- Support Non-Palette Textures: 8, 16, and 32 bit
- Floating-point Triangle Setup with Vertex Level Commands
- Flat and Gouraud Shaded line drawing, with patterning
- Table and Vertex Fog
- Specular Highlighting
- Full Alpha blending
- Alpha Compare Testing
- 3D Color Keying with Color Range Support
- Backface Culling
- Bilinearly Filtered Scaling
- Power of 2 Display Zooming
- Support 8, 16, 32 bits per pixels Destination Format
- 16 and 24 bit per pixel Z Buffer Support
- Hardware 3D Volume Clipping
- 16-bit Logical Addressing in both X and Y
- Two configurable frame buffer windows
- Transparent BLT and Two operand BitBLT
- Display List Processor
- Color Space Converter: YUV-RGB Conversion
- VGA
- 250 MHz RAMDAC
- 0.35 micron 3.3 volt CMOS process
- 388 PBGA (Plastic Ball Grid Array)

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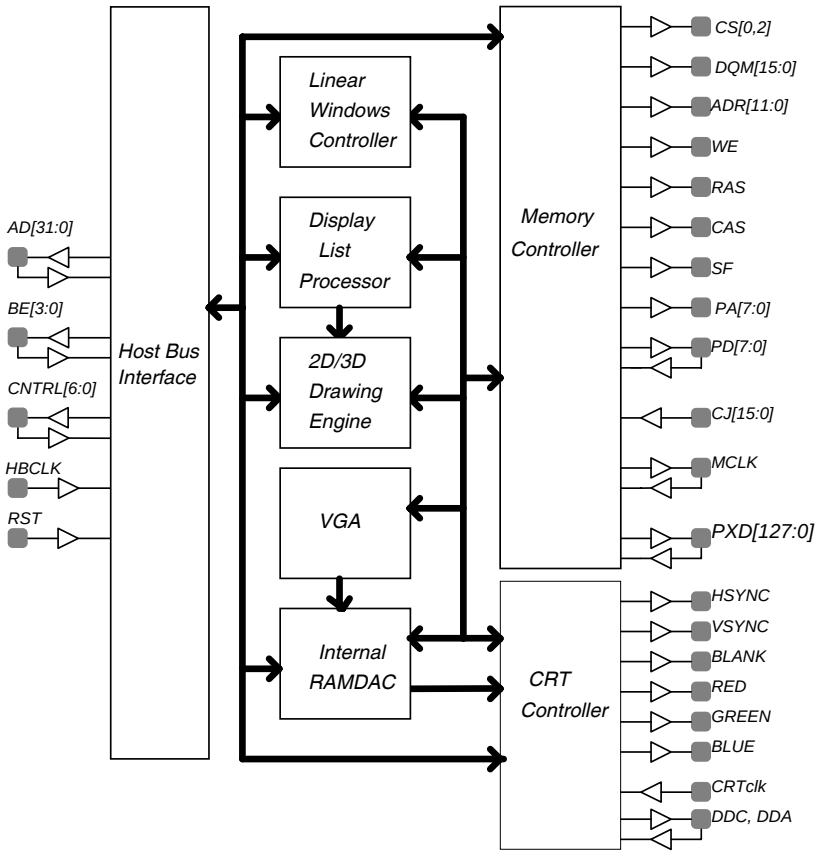
The Borealis design is based on technology licensed by Rastergraf from S3/Number Nine. The chip itself is manufactured for Rastergraf by LSI Logic using LSI's .35u G-10P ASIC process.

The Borealis graphics controller is implemented using a highly pipelined graphic processor architecture. This architecture allows for high performance 2D and 3D rendering. After a sequence of commands and parameters are written, the Borealis executes the selected command without any further host processor intervention. A Display List Processor enables the Borealis to repetitively execute strings of commands.

The Borealis supports a local frame buffer with up to 32 MB SGRAM using a 128-bit wide data bus. The frame buffer may be accessed as linear buffers through the frame buffer interface or through the drawing engine.

The large local buffer may be used as a display buffer, as well as off-screen memory to be used for the storage and manipulation of bitmaps, texture maps, Z buffering or fonts.

Figure 1-1 Borealis Block Diagram



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1.2.2 DVI Digital Output

The Eclipse3 may be ordered with a DVI-compliant transmitter which provides high quality 24-bit true color digital output over twisted pair cables up to 5 meters in length. This length may be increased by using shielded twin-ax or fiber-optic cables. Displays ranging up to 1600 x 1200 are supported. Three TMDS data channels send data at 1.65 Gbps per channel. Connections to the Eclipse3 are made through the front DVI-I connector.

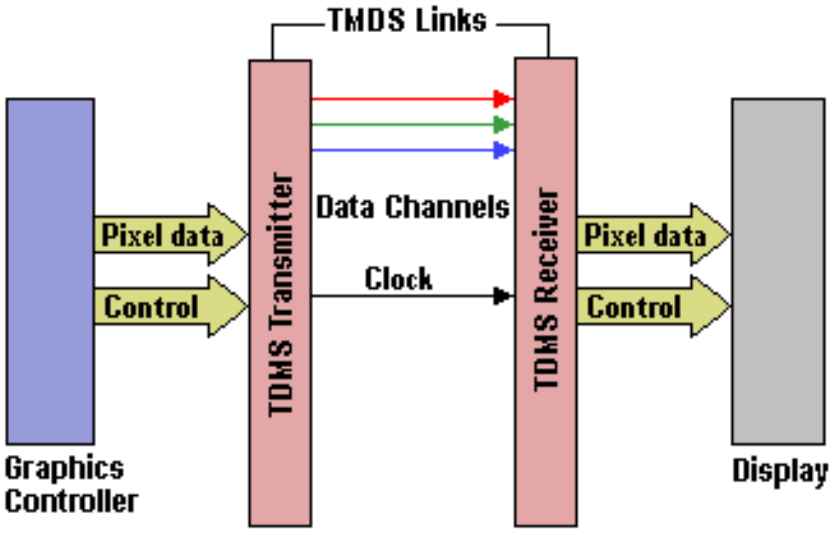

Figure 1-2 DVI Digital Video Block Digram

1.2.3 Software Support

Rastergraf software support is available for many operating systems. Support for multiple display heads is included. The software packages are:

SDL Graphics Subroutine Library

Windows 2000/XP Drivers

Sun/Solaris Accelerated 2D and 3D DDX X Window System Server

Complete X Windows X11R6 server based on Xfree86 Version 4.2

Quad-Image-BIOS supports all combinations of FCode, VGA, DVI, and Sync-On-Green.

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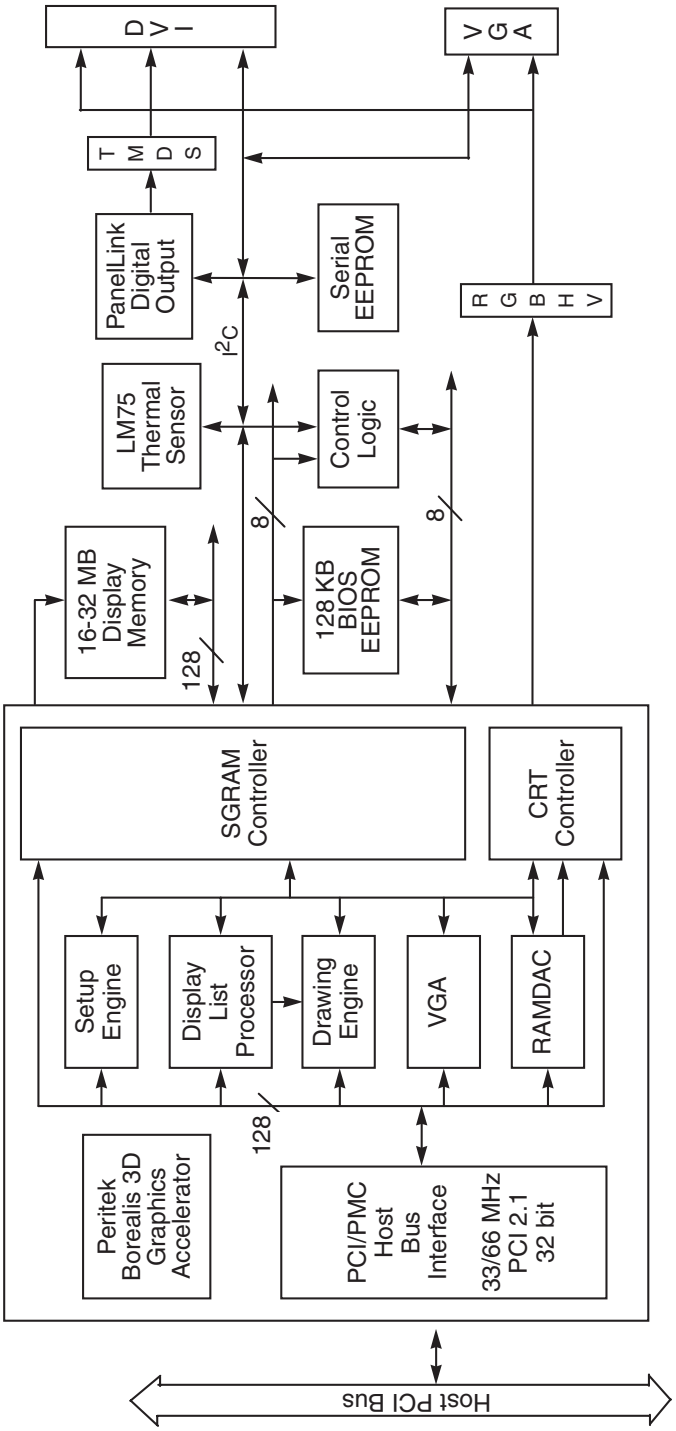

Figure 1-3 Eclipse3 Block Diagram

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1.3 Additional References

You can find Rastergraf documentation and technical literature on the Rastergraf web page (http://www.rastergraf.com).

The ***CompactPCI Specification – PICMG R2.0 R3.0***, the ***CompactPCI Hot Swap Specification – PICMG 2.1 R2.0*** and the ***CompactPCI Hot Swap Infrastructure Interface Specification PICMG 2.12 R1.0*** standards and other information are available from **PICMG:**

Web Page: https://www.picmg.org/index.stm

The ***PCI Local Bus 2.2 Specification*** is maintained by the **PCI Special Interest Group** (PCISIG)

Web Page: http://www.pcisig.com/home

Graphics Textbooks

Fundamentals of Interactive Computer Graphics
Addison Wesley, 1993. Foley and Van Dam

Principles of Interactive Computer Graphics
McGraw-Hill, 1979 Newman and Sproull

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1.4 Specifications for the Eclipse3

The Eclipse3 are available in several configurations:

Analog:	Borealis graphics controller and 16 or 32 MB display memory
DVI:	Borealis graphics controller and 16 or 32 MB display memory and DVI-I DVI/VGA connector. Note that the Eclipse3CPCI and Eclipse3PCI have both VGA and DVI-I connectors.
Special Order:	LEDs, LM75 thermal sensor, Serial EEPROM, Conformal Coating, Extended Temperature. Rear Panel I/O (CPCI J2).

Standard Features for Eclipse3 Boards

Graphics Processor:	Rastergraf Borealis 2D/3D High Performance 128-Bit Graphics Processor has vector and pixblt functions and programmable video timing. It supports SGRAM color and write-per-bit register functions and includes a VGA core. The maximum supported frequencies are 250 MHz for the pixel clock and 100 MHz for the memory clock.
Display Memory:	Display memory is 16 MB or 32 MB of 128-bits/word, byte addressable, no-wait state SGRAM. 16 MB of SGRAM gives eight pages of 1600 x 1200 using 8-bit pixels, four pages using 16-bit pixels, or two pages using 32 bpp. 24 bpp packed pixel mode is not supported.
EEPROM Memory:	128 KB Flash EEPROM contains the Rastergraf Quad Image BIOS (QIB) that supports SPARC FCode, VGA BIOS, DVI, and Sync-On-Green (SOG). A user jumper enables the QIB to select SOG.
Graphics Display:	The Borealis chip has an internal 250 MHz RAMDAC. It has a 256 entry Look Up Table (LUT), which is converts 8-bit pixels into full 24-bit RGB pixels. The RAMDAC has a programmable four color bit-mapped 64 x 64 cursor. It supports VGA and common non-interlaced displays ranging from 640 x 480 up to 1920 x 1200. Signature registers enable display analysis for end to end testing. The pixel size can be 8, 15, 16, or 32-bits. For 15 and 16 bpp, the pixel is divided into Red, Green, and Blue: 5:5:5 or 5:6:5. For 32 bpp, pixel is divided into Red, Green, and Blue (bits 24-31 are unused): 8:8:8:8.

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Scroll, Pan, and Zoom: Scroll - single line (smooth scroll).
Pan - anywhere on 16 byte boundaries
Zoom: horizontal: 2, 4, 8, 16, vertical: 2, 3 ,...,15, 16

Digital Output (Optional): The Eclipse3 can supply a digital output using a THine THC63DV164 DVI encoder. The Borealis Video Out Bus, which supplies TTL level RGB and Sync, is sampled and multiplexed and driven onto 4 differential pairs.

Because of the high frequency nature of the TMDS signals, it is vital that matched length, shielded pair cable be used for DVI connections.

The standard front panel analog VGA connector is replaced by a DVI-I connector. This connector supplies both the digital DVI (TMDS) signals and VGA. Rastergraf can supply an adapter that allows a standard VGA cable to be used when a DVI display is not desired or available.

Composite Video Signal: A jumper can be installed to select Sync-On-Green operation on boot-up. The signal has the following approximate values:

1 Volt peak to peak consisting of:
660 mV Reference White +
54 mV Reference Black +
286 mV Sync Level

Display Timing: The Borealis chip display timing is programmable. The following tables provide the timing values provided by Rastergraf software.

Table 1-1 Eclipse3 SDL Platform Display Timing Specifications

Active Display	Analog/ DVI	Format	Bits per Pixel	Vertical Refresh	Horizontal Refresh	Pixel Clock
640 x 480	Both	VGA	8, 16, 32	60 Hz	31.55 KHz	27 MHz
800 x 600	Both	SVGA	8, 16, 32	60 Hz	39.35 KHz	42 MHz
1024 x 768	Both	UVGA	8, 16, 32	70 Hz	58.86 KHz	80.52 MHz
1152 x 900	Both	Sun	8, 16, 32	66 Hz	64.92 KHz	99.72 MHz
1280 x 1024	Both	SXGA	8, 16, 32	74 Hz	82.86 KHz	141.5 MHz
1600 x 1200	Both	UXGA	8, 16, 32	60 Hz	75 KHz	162.0 MHz
1920 x 1200	Analog	WUXGA	8, 16, 32	60 Hz	75 KHz	194.4 MHz

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Table 1-2 Eclipse3 FCode/Solaris Platform Display Timing Specifications

Active Display	Analog/ DVI	Index	Bits per Pixel	Vertical Refresh	Horizontal Refresh	Pixel Clock
640 x 480	Both	8 9	8, 16, 32	60 Hz 75 Hz	31.5 KHz 37.5 KHz	25.2 MHz 31.5 MHz
800 x 600	Both	6 7	8, 16, 32	60 Hz 75 Hz	37.9 KHz 46.9 KHz	40 MHz 49.5 MHz
1024 x 768	Both	0 1	8, 16, 32	60 Hz 75 Hz	48.4 KHz 60.0 KHz	65.0 MHz 78.8 MHz
1152 x 864	Both	2 3	8, 16, 32	60 Hz 75 Hz	56.7 KHz 67.5 KHz	87.1 MHz 108 MHz
1152 x 900	Both	a b	8, 16, 32	60 Hz 75 Hz	59.0 KHz 73.8 KHz	90.7 MHz 114.5 MHz
1280 x 1024	Both Analog	4 5	8, 16, 32	60 Hz 75 Hz	64.0 KHz 80.0 KHz	108 MHz 135 MHz
1600 x 1200	Both	c	8, 16, 32	60 Hz	75 KHz	162.0 MHz
1920 x 1200	Analog	d	8, 16, 32	60 Hz	75 KHz	194.4 MHz

Table 1-3 Eclipse3 VGA/Windows Platform Display Timing Specifications

Active Display	Analog/ DVI	VESA Format	Bits per Pixel	Vertical Refresh	Horizontal Refresh	Pixel Clock
640 x 480	Both	n/a VGA VGA VGA	8, 16, 32	60 Hz 72 Hz 75 Hz 85 Hz	31.5 KHz 37.9 KHz 37.5 KHz 43.4 KHz	25.175 MHz 31.5 MHz 31.5 MHz 36 MHz
800 x 600	Both	SVGA	8, 16, 32	60 Hz 72 Hz 75 Hz 85 Hz	37.9 KHz 48.1 KHz 46.9 KHz 53.7 KHz	40 MHz 50 MHz 49.5 MHz 56.25 MHz
1024 x 768	Both	UVGA	8, 16, 32	60 Hz 70 Hz 75 Hz 85 Hz	48.4 KHz 56.5 KHz 60.0 KHz 68.7 KHz	65 MHz 75 MHz 78.75 MHz 94.5 MHz
1152 x 864	Both	Sun	8, 16, 32	75 Hz	67.5 KHz	108 MHz
1280 x 1024	Both Analog Analog	SXGA	8, 16, 32	60 Hz 75 Hz 85 Hz	64 KHz 80 KHz 91.1 KHz	108 MHz 135 MHz 157.5 MHz
1600 x 1200	Both Analog Analog Analog	UXGA	8, 16, 32	60 Hz 70 Hz 75 Hz 85 Hz	75 KHz 87.5 KHz 93.8 KHz 106.3 KHz	162 MHz 189 MHz 202.5 MHz 229.5 MHz
1920 x 1200	Analog	GTF (WUXGA)	8, 16, 32	60 Hz	75 KHz	194.4 MHz

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Fuse Element: The +5V supplied to the front panel connectors is protected by a Positive Temperature Coefficient (PTC) resistor. It resets automatically when the overload is removed.

Local I^2C Channel: The Eclipse3 uses I^2C, a 2 wire serial bus, to control the following on-board devices:

THC63DV164 DVI transmitter (optional)
LM75 thermal sensor (optional)
AT24C02 2 Kb serial EEPROM (optional)
DDC2B display monitor control

Power-management: With the proper software, the Borealis can power-down unused functions and the VESA standard DDC2B lines control the monitor.

PCI Bus Access: Programmable Bus Address Registers (BARs) in the Borealis map control and drawing engine registers, and display memory through its 33/66 MHz PCI interface.

PCI bus Interrupts: The Borealis can interrupt the PCI bus on the INTA line.

Bus Loading: One PCI 2.1 compatible load

Module Size:

PMC: IEEE 1386-2001,
149 mm x 74 mm, 32-bit, 33/66 MHz, J1/J2

CompactPCI: PICMG 2.0 Rev 3, IEEE 1101.10,
3U form factor w/ ESD strip,
32-bit, 33/66 MHz, J1 only, no hotswap.
3U and 6U front panel options.

Optional rear-panel module connecting to CPCI J2 is standard 3U rear I/O format.
3U and 6U rear panel options.

PCI: short PCI, 32-bit, 33/66 MHz, 64-bit connector set is used for improved power and ground distribution

PCI Subsystem Vendor ID: 0x10F0 (CW Vendor Code)

PCI Subsystem Device ID: 0x0003 for 16 MB boards, 0x0007 for 32 MB boards

Power Requirements: Standard versions ***REQUIRE*** that the PMC, CompactPCI, or PCI bus connectors supply both +5V and +3.3V. A location for a local 3.3V regulator is provided on the PMC and PCI boards for systems which do not supply 3.3V to the backplane.

+5V +/- 5%, 0.2 A max
+3.3V +/- 5%, 1.2 A max

PCI Bus pin PRSNT1# is set low, indicating 7.5W max.

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Environment:

Temperature:	0 to 70 degrees C, operating -55 to +85 degrees C, storage
Humidity:	5% to 90%, non-condensing

Enhanced Status:

Special order features include:

Three LEDs that can be driven by host CPU software.

A 2Kb Serial EEPROM stores the serial number, display timing information, and customer specific parameters.

An LM75 thermal sensor provides limit flags and real-time temperature read-back.

Ruggedization Option:

Rastergraf offers semi-ruggedized versions of the Eclipse3 boards include a MIL-compliant silicone or acrylic conformal coating and extended temperature testing.

Rastergraf board designs use standard distribution commercial temperature range parts***. No formal component tracking is maintained.*** .

Boards are protected with either Acrylic (Miller-Stephenson MS-475) or Silicone (Miller-Stephenson MS-460) or equivalent and are MIL-I-46058C, Type SR and MIL-T-152B compliant. The board is tested under extended temperature conditions as shown on the next page.

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Ruggedization Levels: The following table shows the standard ruggedization levels. At the time of writing, complete shock and vibration testing has not been performed, but some boards have been tested enough to expect full acceptance is possible. Please contact Rastergraf Sales if you need this information.

Table 1-3 Rastergraf Ruggedization Levels Chart

Spec	Air-Cooled Level 0	Air-Cooled Level 50	Air-Cooled Level 100	Air-Cooled Level 200	Conduction-cooled Level 100	Conduction-cooled Level 200
Applicable Graphics Board(s)	Argus Gemini Sirena Eclipse3 Topaz Garnet	Gemini Sirena Eclipse3 Topaz Garnet	Gemini Sirena Eclipse3 Topaz Garnet	Eclipse3 Topaz Garnet	Garnet	Garnet
Operating Temperature (4, 6)	0°C to 50°C	-20°C to 65°C	-40°C to 71°C	-40°C to 85°C	-40°C to 71°C	-40°C to 85°C
Storage	-40°C to 85°C	-40°C to 85°C	-55°C to 125°C	-55°C to 125°C	-55°C to 125°C	-55°C to 125°C
Humidity Operating	0 to 95% non-condensing	0 to 100% non-condensing	0 to 100% non-condensing	0 to 100% non-condensing	0 to 100% non-condensing	0 to 100% non-condensing
Humidity Storage	0 to 95% condensing	0 to 100% condensing	0 to 100% condensing	0 to 100% condensing	0 to 100% condensing	0 to 100% condensing
Vibration Sine (1)	2 g peak 15-2 kHz	2 g peak 15-2 kHz	10 g peak 15-2 kHz	10 g peak 15-2 kHz	10 g peak 15-2 kHz	10 g peak 15-2 kHz
Vibration Random (2)	0.01 g2/Hz 15-2 kHz	0.02 g2/Hz 15-2 kHz	0.04 g2/Hz 15-2 kHz	0.04 g2/Hz 15-2 kHz	0.1 g2/Hz 15-2 kHz	0.1 g2/Hz 15 Hz-2 kHz
Shock (3)	20 g peak	20 g peak	30 g peak	30 g peak	40 g peak	40 g peak
Conformal Coat (5)	optional	optional	optional	optional	yes	yes
Order Option (7)	/CA or /CS	/A5A or /A5S	/A1A or /A1S	/A2A or /A2S	/C1A or /C1S	/C2A or /C2S

Notes:

1. Sine vibration based on a sine sweep duration of 10 minutes per axis in each of three mutually perpendicular axes. May be displacement limited from 15 to 44 Hz, depending on specific test equipment. Shock and Vibration values not completely verified.
2. Random vibration 60 minutes per axis, in each of three mutually perpendicular axes.
3. Three hits in each axis, both directions, 1/2 sine and saw tooth. Total 36 hits.
4. Standard air-flow is 8 cfm at sea level. Some higher-powered products may require additional airflow. Consult the factory for details.
5. Conformal coating type to be specified by customer. Consult the factory for details.
6. Temperature is measured at the card interior (not at edge).
7. Last letter in ordering option: A for Acrylic Conformal Coating, S for Silicone Conformal Coating

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1.5 Eclipse3 Connectors and Cables

There are two possible connector locations on the front panel of the Eclipse3 graphics boards.

> **Note:**
>
> Due to front panel space limitations, the PMC board can have ***either*** the VGA ***or*** the DVI connector installed. The PCI and CompactPCI boards have both installed.

The Eclipse3 “Standard” versions use a standard 15-pin VGA compatible connector. RGBHV (Red, Green, Blue, and Horizontal and Vertical sync) and DDC/DDA monitor control signals are supplied.

The Eclipse3 DVI option use a **DVI-I** 29-pin connector. This connector supplies: RGBHV (Red, Green, Blue, and Horizontal and Vertical sync), DDC/DDA monitor control signals, as well as DVI digital video output. An adapter connector (Molex 88741-8700, available from Digikey) is available from Rastergraf that adapts the DVI-I to a standard VGA connector.

The CPCI rear-panel I/O option includes a rear I/O module with VGA and/or DVI connectors mounted to either a 3U or 6U panel.

The following sections detail the applicable pinout information.

Connector	Description	Section
15-pin D-Sub	**VGA**	1.5.1
29-pin DVI-I	**DVI-I** Connector	1.5.2
2 x 64 PMC	**PMC** Connections (J1 and J2)	1.5.3
1 x 96 PCI	**PCI** Connections (32/64)	1.5.4
1 x 125 2 mm	**CompactPCI** Connection (J1)	1.5.5
1 x 110 2 mm	Optional **CompactPCI** Connection (J2)	1.5.6

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1.5.1 VGA Connector

The graphics board analog output is provided on a standard VGA style compressed 15 pin D-Sub. Alternatively, when the DVI-I connector is used (see Section 1.5.2), an adapter (Molex 88741-8700) can be used to supply analog video to a standard VGA ***computer side*** connector.

In either case, an "Autoscan" type monitor is used. You must use the correct initialization, since a VGA monitor depends on the sync polarities to determine operating frequency. The polarity of the Vertical/Composite Sync and Horizontal Sync are controlled by the Borealis graphics controller chip (see Section 4.5). ***See the* Note *in Section 2.9.2 concerning composite sync on green and RGBHV video out modes.*** If you have problems, please contact Rastergraf for assistance.

The R, G, and B video outputs are driven by the Borealis graphics controller chip which is capable of driving terminated cable (75 ohms) to standard RS-330/IRE levels. Cable length should be limited to 50 feet unless you use low loss RG-59.

Rastergraf has used an outside cable shop to build production cables:

Lynn Products, Inc.
http://www.lynnprod.com

If you really want to roll you own, the PMC board side connector is an AMP 177802-3. The CompactPCI and PCI board side connector is an Adam-Tech HDL15-SLB. Be sure to use 75 ohm coax for the R, G, B. You can use TP or coax on H, and V. A cable that would work is Mogami W3206-8 (http://www.mars-cam.com/ccd/mogami/digital3.html).

The following table provides the cable connection information:

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Table 1-4 Analog (VGA) Video Connector Pinout

VGA Pin	Description	Ground Type	Cable Type
1	Red	75 ohm Coax with pin 6	
2	Green	75 ohm Coax with pin 7	
3	Blue	75 ohm Coax with pin 8	
4	not used		
5	DDC Ground	Circuit Ground	
6	Red Ground	Circuit Ground	
7	Green Ground	Circuit Ground	
8	Blue Ground	Circuit Ground	
9	Fused +5 Volts, .25A max		
10	Sync Ground	Circuit Ground	
11	Ground	Circuit Ground	
12	DDCDA		Twisted Pair with GND to pin 10
13	HSYNC		Twisted Pair with GND to pin 5
14	VSYNC		Twisted Pair with GND to pin 10
15	DDCCK		Twisted Pair with GND to pin 5
-	Connector Shell	Chassis Ground	
-	Outer Shield (Cable Jacket)	Chassis Ground	

Warning:

The Chassis Ground **MUST NOT BE CONNECTED** to Circuit Ground.

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1.5.2 DVI-I Connector

The DVI front panel connector is a DVI-I (analog/digital) (http://www.ddwg.org/) connector. DVI uses the DVI TMDS encoded data format, which allows longer data cables and reduces emitted noise. Each of the three differential pairs carries nine digital video (TTL) lines. A separate pair carries the PLL clock for the TMDS system. TMDS requires that the length of all pairs must be closely matched. The Borealis boards use a THine THC63DV164 DVI transmitter. Data sheets and application notes are available on the THine web page (http://www.thine.co.jp).

You can access the VGA from the DVI-I connector with an adapter (Molex 88741-8700, available from Digikey). It supplies analog video (only) to a standard VGA connector. There is no split-off for DVI. You can also get cables and/or adapters that provide both analog ***and*** digital or just analog ***or*** digital.

Rastergraf strongly urges you to obtain commercially manufactured cables and/or adapters that are available from Rastergraf, Molex, and other suppliers. But, if you really want to roll you own, the board side connector part number is Molex 74320-1004 with Molex 71781-0001 (or equivalent) jackposts with Loctite. A cable that would work is Mogami W3206-8 (http://www.mars-cam.com/ccd/mogami/digital6.html).

Table 1-5 DVI-I Connector Pinout

DVI-I Pin	Description
1	DVI_TX2L
2	DVI_TX2H
3	DVI_TX2 Shield/Ground
6	DDCCK
7	DDCDA
8	Vertical Sync
9	DVI_TX1L
10	DVI_TX1H
11	DVI_TX1 Shield/Ground
14	Fused +5 Volts, .25A max
15	Ground
17	DVI_TX0L
18	DVI_TX0H
19	DVI_TX0 Shield/Ground
22	DVI_TXC Shield/Ground
23	DVI_TXCH
24	DVI_TXCL
4, 5, 12, 13, 16, 20, 21	n/c
C1	Red
C2	Green
C3	Blue
C4	Horizontal Sync
C5	Analog Ground

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1.5.3 Connections to the PMC Bus

J11					J12			
1	n/c	n/c	2		1	n/c	n/c	2
3	GND	PINTAL	4		3	n/c	n/c	4
5	n/c	n/c	6		5	n/c	GND	6
7	BUSMODE1L	VCC (5V)	8		7	GND	n/c	8
9	n/c	n/c	10		9	n/c	n/c	10
11	GND	n/c	12		11	BUSMODE2L	VDD (3.3V)	12
13	PCICLK	GND	14		13	PCIRSTL	BUSMODE3L	14
15	GND	PMCGNTL	16		15	VDD (3.3V)	BUSMODE4L	16
17	PMCREQL	VCC (5V)	18		17	n/c	GND	18
19	byp (Vio)	AD31H	20		19	AD30H	AD29H	20
21	AD28H	AD27H	22		21	GND	AD26H	22
23	AD25H	GND	24		23	AD24H	VDD (3.3V)	24
25	GND	C/BE3L	26		25	IDSEL	AD23H	26
27	AD22H	AD21H	28		27	VDD (3.3V)	AD20H	28
29	AD19H	VCC (5V)	30		29	AD18H	GND	30
31	byp (Vio)	AD17H	32		31	AD16H	C/BE2L	32
33	FRAMEL	GND	34		33	GND	n/c	34
35	GND	IRDYL	36		35	TRDYL	VDD (3.3V)	36
37	DEVSELL	VCC (5V)	38		37	GND	STOPL	38
39	GND	n/c	40		39	n/c	GND	40
41	n/c	n/c	42		41	VDD (3.3V)	n/c	42
43	PAR	GND	44		43	C/BE1L	GND	44
45	byp (Vio)	AD15H	46		45	AD14	AD13H	46
47	AD12H	AD11H	48		47	M66EN	AD10H	48
49	AD09H	VCC (5V)	50		49	AD08H	VDD (3.3V)	50
51	GND	C/BE0L	52		51	AD07H	n/c	52
53	AD06H	AD05	54		53	VDD (3.3V)	n/c	54
55	AD04H	GND	56		55	n/c	GND	56
57	byp (Vio)	AD03H	58		57	n/c	n/c	58
59	AD02H	AD01H	60		59	GND	n/c	60
61	AD00H	VCC (5V)	62		61	n/c	VDD (3.3V)	62
63	GND	n/c	64		63	GND	n/c	64

Notes: byp means the pin is connected to a bypass capacitor on the graphics board but is otherwise not used.

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1.5.4 Connections to the PCI Bus

SIDE A		SIDE B			SIDE A		SIDE B	
1	n/c	n/c	1		33	VDD (3.3V)	PCBE2L	33
2	n/c	n/c	2		34	PFRAMEL	GND	34
3	n/c	GND	3		35	GND	PIRDYL	35
4	JTAGTDIOH	JTAGTDIOH	4		36	PTRDYL	VDD (3.3V)	36
5	VCC (5V)	VCC (5V)	5		37	GND	PDEVSELL	37
6	PINTAL	VCC (5V)	6		38	PSTOPL	GND	38
7	n/c	n/c	7		39	VDD (3.3V)	n/c	39
8	VCC (5V)	n/c	8		40	n/c	n/c	40
9	n/c	PRSNT1L	9		41	n/c	VDD (3.3V)	41
10	byp (Vio)	n/c	10		42	GND	n/c	42
11	n/c	PRSNT2L	11		43	PPARH	VDD (3.3V)	43
12	keyway	keyway	12		44	PAD15H	PCBE1L	44
13	keyway	keyway	13		45	VDD (3.3V)	PAD14H	45
14	n/c	n/c	14		46	PAD13H	GND	46
15	PPCIRSTL	GND	15		47	PAD11H	PAD12H	47
16	byp (Vio)	PPCICLK	16		48	GND	PAD10H	48
17	PCIGNTL	GND	17		49	PAD09H	n/c	49
18	GND	PCIGNTL	18		50	keyway	keyway	50
19	n/c	byp (Vio)	19		51	keyway	keyway	51
20	PAD30H	PAD31H	20		52	PCBE0L	PAD08H	52
21	VDD (3.3V)	PAD29H	21		53	VDD (3.3V)	PAD07H	53
22	PAD28H	GND	22		54	PAD06H	VDD (3.3V)	54
23	PAD26H	PAD27H	23		55	PAD04H	PAD05H	55
24	GND	PAD25H	24		56	GND	PAD03H	56
25	PAD24H	VDD (3.3V)	25		57	PAD02H	GND	57
26	PIDSELH	PCBE3L	26		58	PAD00H	PAD01H	58
27	VDD (3.3V)	PAD23H	27		59	byp (Vio)	byp (Vio)	59
28	PAD22H	GND	28		60	n/c	n/c	60
29	PAD20H	PAD21H	29		61	VCC (5V)	VCC (5V)	61
30	GND	PAD19H	30		62	VCC (5V)	VCC (5V)	62
31	PAD18H	VDD (3.3V)	31		63	GND	n/c	63
32	PAD16H	PAD17H	32		64	n/c	GND	64

Note: byp means the pin is connected to a bypass capacitor on the graphics board but is otherwise not used

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1.5.4 Connections to the PCI Bus (continued)

SIDE A		SIDE B	
65	n/c	n/c	65
66	byp (Vio)	n/c	66
67	n/c	GND	67
68	n/c	n/c	68
69	GND	n/c	69
70	n/c	byp (Vio)	70
71	n/c	n/c	71
72	GND	n/c	72
73	n/c	GND	73
74	n/c	n/c	74
75	byp (Vio)	n/c	75
76	n/c	GND	76
77	n/c	n/c	77
78	GND	n/c	78
79	n/c	byp (Vio)	79
80	n/c	n/c	80
81	GND	n/c	81
82	n/c	GND	82
83	n/c	n/c	83
84	byp (Vio)	n/c	84
85	n/c	GND	85
86	n/c	n/c	86
87	GND	n/c	87
88	n/c	byp (Vio)	88
89	n/c	n/c	89
90	GND	n/c	90
91	n/c	GND	91
92	n/c	n/c	92
93	GND	n/c	93
94	n/c	GND	94

Note: byp means the pin is connected to a bypass capacitor on the graphics board but is otherwise not used

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1.5.5 J1 Connections to the CompactPCI Bus

A		B		C		D		E	
1	VCC (5V)	1	byp (-12V)	1	n/c	1	byp (+12V)	1	VCC (5V)
2	n/c	2	VCC (5V)	2	n/c	2	TDIOH	2	TDIOH
3	INTA#	3	n/c	3	n/c	3	VCC (5V)	3	n/c
4	n/c	4	GND	4	byp (Vio)	4	n/c	4	n/c
5	n/c	5	n/c	5	PCIRSTL	5	GND	5	GNT#
6	PCIREQ#	6	GND	6	VDD (3.3V)	6	PCICLK	6	AD[31]
7	AD[30]	7	AD[29]	7	AD[28]	7	GND	7	AD[27]
8	AD[26]	8	GND	8	byp (Vio)	8	AD[25]	8	AD[24]
9	CBE[3]#	9	IDSEL	9	AD[23]	9	GND	9	AD[22]
10	AD[21]	10	GND	10	VDD (3.3V)	10	AD[20]	10	AD[19]
11	AD[18]	11	AD[17]	11	AD[16]	11	GND	11	CBE[2]#
12	keyway	12	keyway	12	keyway	12	keyway	12	keyway
13	keyway	13	keyway	13	keyway	13	keyway	13	keyway
14	keyway	14	keyway	14	keyway	14	keyway	14	keyway
15	VDD (3.3V)	15	FRAME#	15	IRDY#	15	GND	15	TRDY#
16	DEVSEL#	16	GND	16	byp (Vio)	16	STOP#	16	n/c
17	VDD (3.3V)	17	n/c	17	n/c	17	GND	17	n/c
18	n/c	18	GND	18	VDD (3.3V)	18	PAR	18	CBE[1]#
19	VDD (3.3V)	19	AD[15]	19	AD[14]	19	GND	19	AD[13]
20	AD[12]	20	GND	20	byp (Vio)	20	AD[11]	20	AD[10]
21	VDD (3.3V)	21	AD[09]	21	AD[08]	21	n/c	21	CBE[0]#
22	AD[07]	22	GND	22	VDD (3.3V)	22	AD[06]	22	AD[05]
23	VDD (3.3V)	23	AD[04]	23	AD[03]	23	VCC (5V)	23	AD[02]
24	AD[01]	24	VCC (5V)	24	byp (Vio)	24	AD[00]	24	n/c
25	VCC (5V)	25	n/c	25	n/c	25	VDD (3.3V)	25	VCC (5V)

Note: byp means the pin is connected to a bypass capacitor on the graphics board but is otherwise not used.

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1.5.5 J2 Connections to the CompactPCI Bus (optional)

	Z	A	B	C	D	E	F
1	GND	PK_GND	GND	RIO_BVSYNC	RIO_DDCH	PK_GND	GND
2	GND	RIO_TX2L	VCC		RIO_TX1L	RIO_TX0L	GND
3	GND	RIO_TX2H	GND	RIO_BHSYNC	RIO_TX1H	RIO_TX0H	GND
4	GND	VIO			GND		GND
5	GND			VIO			GND
6	GND				GND		GND
7	GND		GND	VIO			GND
8	GND				GND		GND
9	GND		GND	VIO			GND
10	GND				GND		GND
11	GND		GND	VIO			GND
12	GND				GND		GND
13	GND		GND	VIO			GND
14	GND				GND		GND
15	GND		GND		RIO_BLU	RIO_RED	GND
16	GND				GND		GND
17	GND		GND		RIO_GRN	RIO_DDAH	GND
18	GND				GND		GND
19	GND	GND	GND				GND
20	GND	RIO_TXCH	GND		GND		GND
21	GND	RIO_TXCL	GND				GND
22	GND	n/c	n/c	n/c	n/c	n/c	GND

Note: byp means the pin is connected to a bypass capacitor on the graphics board but is otherwise not used

Pins used for Rear Panel I/O are used in Slot 1. This board MUST NOT be installed in Slot 1.

PK_GND are grounds that are added by Rastergraf.

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1.6 Monitor Requirements

Rastergraf graphics boards can be used with a variety of monitors. For best performance a monitor should have the following features:

- VGA compatible 5 Wire RGB with separate TTL horizontal and vertical sync or 3 Wire RGB with sync on green (see note below)
- Switchable Termination (for monitor loopthrough)
- Height, pincushion, width, phase, and position controls
- Autotracking horizontal and vertical synchronization
- See tables in Section 1.4 (above) for basic timing requirements

Notes

The Eclipse3 software defaults to standard Multiscan 5-wire RGBHV (VGA compatible) settings. If you require Sync On Green, be sure to install **SYNC ON GREEN** jumper.

Eclipse3 graphics boards **DO NOT** support interlaced operation.

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1.7 Configuration Information

The basic graphics board includes:

- Rastergraf Borealis Graphics Processor with 8, 16, or 32 bit/pixel
- 16 MB SGRAM
- hardware interrupts, pan, scroll, and zoom and cursors
- analog video outputs
- Quad Image BIOS supports VGA, FCode, DVI, and Sync on Green (SOG)

An on-board 3.3V regulator can be provided on the PMC and PCI boards for systems which do not supply 3.3V to the backplane. CPCI backplanes always have 3.3V. Please contact Rastergraf for more information about this and other special configurations.

Table 1-6 Eclipse3 Software

Operating System	Rastergraf Software	Version	OpenGL and/or DirectX	DVI, SOG	BIOS
Solaris 2.6 - 10	DDX	3.0	no	yes	FCode
Solaris 2.6 - 10	GLDX	1.0	OpenGL	n/a	FCode
Linux	Xfree86	4.2	OpenGL	yes	VGA
VxWorks	SDL	3.x	no	yes	VGA
LynxOS	SDL	3.x	no	yes	VGA
Linux	SDL	3.x	no	yes	VGA
Windows 2K, XP	2K, XP	5.x	OpenGL, DirectX	yes	VGA

Table 1-7 Common Eclipse3 Configurations

Bus Type	32 MB Option	DVI Option	Rear I/O Option	3U/6U Option	Local 3.3V Option	Semi-rugged Option
PMC, PCI	/32MB	/DVI	n/a	n/a	/V	See Table 1-3
CPCI	/32MB	/DVI	/RIO	/3U or /6U	n/a	See Table 1-3

Note: Please contact Rastergraf for complete Model number information.

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Chapter 2
Installing Your Peritek Graphics Board

2.1 Introduction

There are 2 steps involved in getting your Rastergraf Graphics board to work in your system:

- Unpack and install the Rastergraf graphics board.
- Install the software

This chapter shows you how to install the Rastergraf graphics board in your computer. Your Rastergraf software User's Manual (e.g. SDL) provides instructions on how to install the software.

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2.2 Unpacking Your Board

When you unpack your board, inspect the contents to see if any damage occurred in shipping. If there has been physical damage, file a claim with the carrier at once and contact Rastergraf for information regarding repair or replacement. Do not attempt to use damaged equipment.

> **Caution**
>
> Be careful not to remove the board from its antistatic bag or container until you are ready to install it. It is preferable to wear a grounded wrist strap whenever handling computer boards.

Some operating systems require that you reboot your system after installing a device driver, because only after the reboot will your system utilize the driver and recognize the board. If yours is such an operating system, you might like to install your Rastergraf software **before** installing the board since you will have to shut down the computer to install the board anyway. If you want to install the software before shutting down the computer, proceed to the correct part of the relevant software manual and return to this chapter afterwards.

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2.3 Preparing for Installation

The Eclipse3 includes three different board form factors: PMC, PCI, and CompactPCI. In order to ease the procedure, there follows individual sections that deal with each board type. There really aren't any model dependencies that affect the board installation.

2.3.1 Interrupt Settings

The Eclipse3 boards use the PCI/PMC/CPCI **INTA** interrupt request line for the particular slot it is plugged into. In some computers, each slot ***may*** map its local interrupt lines to a permuted set of INTA-INTD, which means that the board will show up on a different interrupt line according to the slot it is plugged into. The device driver will usually notice this and compensate for it. In any case, the user has no direct control (e.g. jumpers) over what interrupt line the graphics board will use.

2.3.2 Address Settings

Since the PCI bus and the Eclipse3 are configured by the operating system and/or BIOS while booting up, there aren't any address jumpers. The address settings are programmable and are set up by the Eclipse3 software as a result of information supplied by the OS at boot time. Refer to the Rastergraf software User's Manuals for more information.

The software sets up the BARs (Base Address Registers) in the Rastergraf Borealis Graphics Processor that enable access to its control registers, internal RAMDAC, DDC2B/ I^2C control lines, and SGRAM.

The Rastergraf Eclipse3 device driver will load the BARs if the O/S or BIOS did not. If you can determine the actual PCI base address, you might even be able to probe the address spaces with an on-line debugger once the driver code has run. Section 3.3 has details on how the Borealis controls access to the on-board registers.

The ability to probe the board is dependent on the CPU memory map as implemented by the system OS and the address ranges of the PCI bus as determined by the CPU hardware. These things change from OS to OS, board to board, and vendor to vendor, making it a difficult task. Most likely, if you use Rastergraf supplied software, the board will show up and you will get pictures.

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2.3.3 Changing the Jumpers

In the following subsections, please refer ***Figure 2-1*** in ***Section 2.4*** for PMC, ***Figure 2-5*** in ***Section 2.5*** for PCI, and ***Figure 2-7*** in ***Section 2.6*** for CompactPCI for to the parts layouts and jumper locations.

JP201: VGA PCI Device Jumper

JP201 selects the board to respond either as a PCI sub-class "VGA Controller Device" (default) or as an "Other Display Controller" (jumper installed). You may need to install this jumper on the second board when you have two Eclipse3 boards installed in a PC compatible machine to prevent the system BIOS from loading the Eclipse3 BIOS code twice.

JP101: Sync-On-Green Select Jumper

The Eclipse3 has the Rastergraf Quad Image BIOS (QIB) PROM, which supports FCode, VGA, DVI, and Sync-On-Green (SOG). The firmware can "determine" the need to run FCode or VGA and if the DVI monitor is plugged in, it will select DVI mode without user intervention. However, a separate jumper is needed to "tell" the firmware that SOG is required. Normally, if SOG is requested prior to order shipment, JP101 is installed at the factory. But, if it has been omitted, then install JP101 to enable SOG.

JP202 (PMC): Reserved Jumper

JP202 is a factory use only jumper. Please do not attempt to use it.

JP233 (PCI): Local 3.3V Regulator Enable

If the graphics board was built with the optional local 3.3V regulator, ***install*** JP233 to enable the regulator to supply power to the graphics board when the PCI backplane only has 5V.

JP102 (CompactPCI) Frame Ground to Chassis Ground Jumpers

Ordinarily, frame ground and chassis ground are isolated from each other. ***Install*** JP102 to connect them together.

> **Note:**
>
> **Make sure before installing the jumper that this does not expose the system to any electrical hazards.**

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2.4 Eclipse3PMC Graphics Board Installation

The Eclipse3PMC board can plug into any 32-bit, 66 MHz, 5V or 3.3V signaling IEEE 1386-2001 compatible single module PMC location. Such locations are most commonly found on VME and CompactPCI computers.

The Eclipse3PMC can be installed in PCI and CompactPCI backplanes by using a Rastergraf PMA-P or PMA-C passive bus adapter. Rastergraf also supplies active carriers for PCI, the PMB-P, and a CompactPCI carrier, the PMB-C, which can hold two PMC boards. Of course, you could also just use an Eclipse3CPCI or Eclipse3PCI.

Note:

Older VME host or carrier boards may not supply 3.3V to the PMC connectors and the Eclipse3 PMC boards require both 3.3V and 5V. By special order, Rastergraf can supply the graphics board with a local 3.3V regulator installed. Please contact Rastergraf for assistance.

Installing the PMC Graphics Board

Note:

Refer to ***Section 2.3.3*** for the settings for JP101 and JP201.

1. Shut down the operating system and **turn off the power**.

Warning!

Never open the computer without turning off the power supply. Unless internal AC wiring is exposed, leave the power cord plugged in, so as to ground the computer chassis. You can easily get shocked, ruin computer parts or both unless you turn off the power. Even with power switched off, lethal voltages can exist in the equipment.

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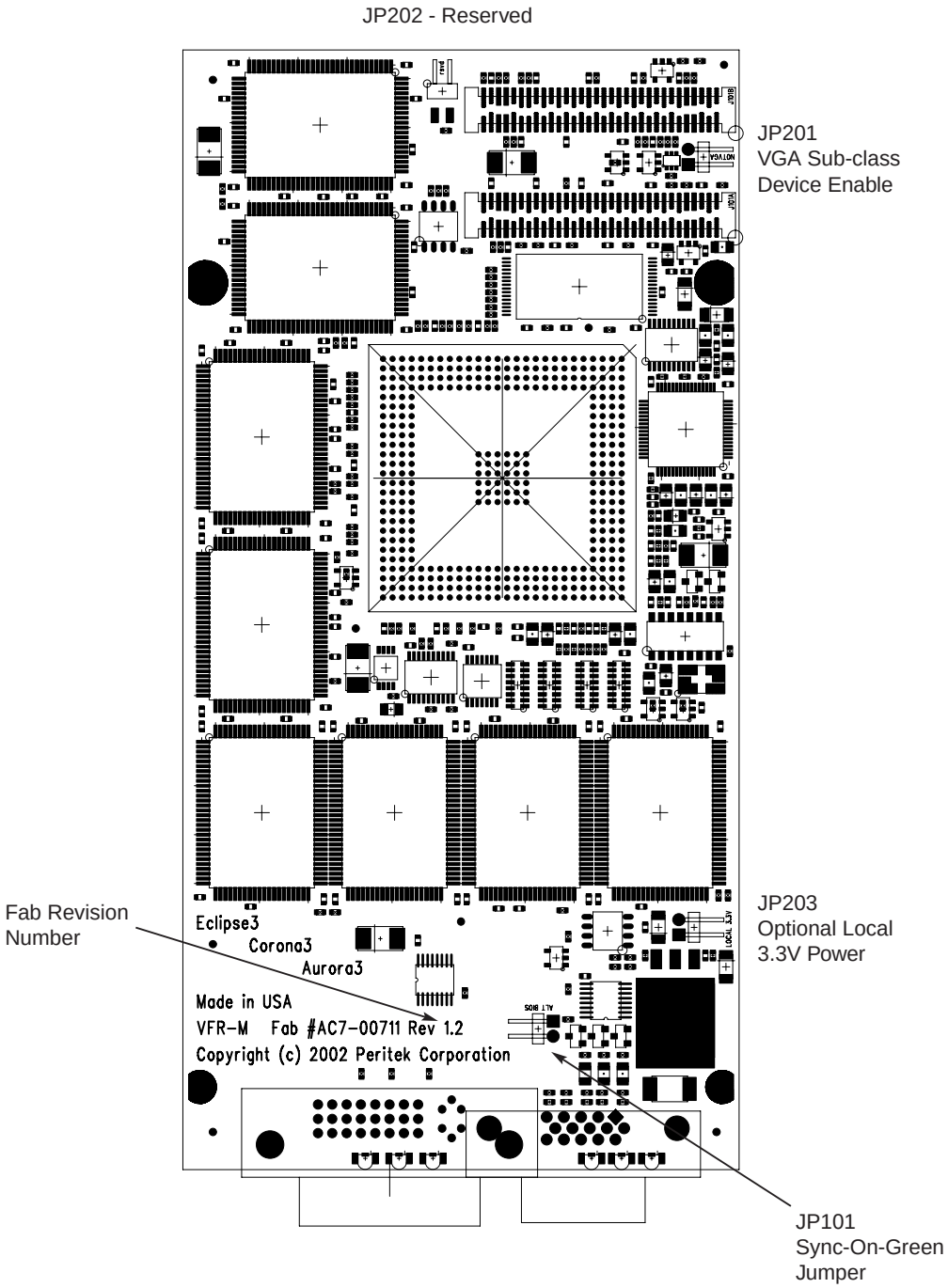
Figure 2-1 Jumper Locations for the Fab Rev 1.2 Eclipse3PMC Board



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2. Open the computer and remove the CPU board onto which the graphics PMC board is to be installed. Identify an empty PMC location (generally there are one or two on a given CPU board). The graphics PMC board is a Universal PMC/PCI device and can be plugged into a PMC port which uses either 5V or 3.3V signaling.
3. Take care to optimize airflow by blocking off unused slots in the card cage, and arrange the boards to permit optimum airflow through them.

Caution

The static electricity that your body builds up normally can seriously damage the components on the graphics board.

Figure 2-2 Installation of a PMC Module into an Emerson MVME2604

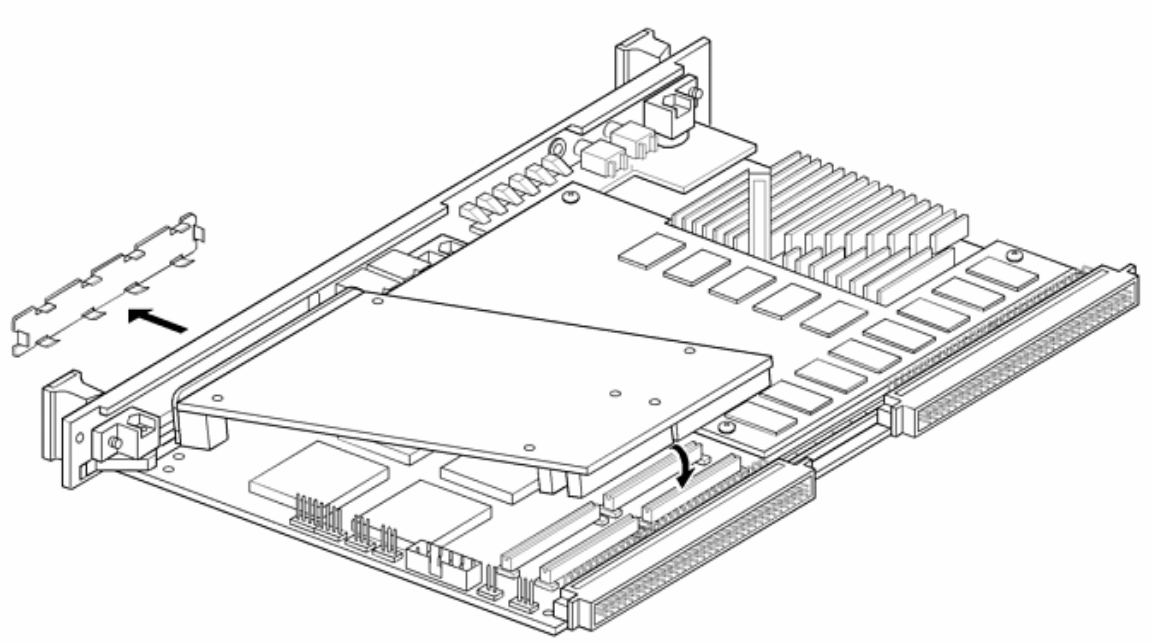

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Figure 2-3 Installation of a PMC Module into the PMB-C

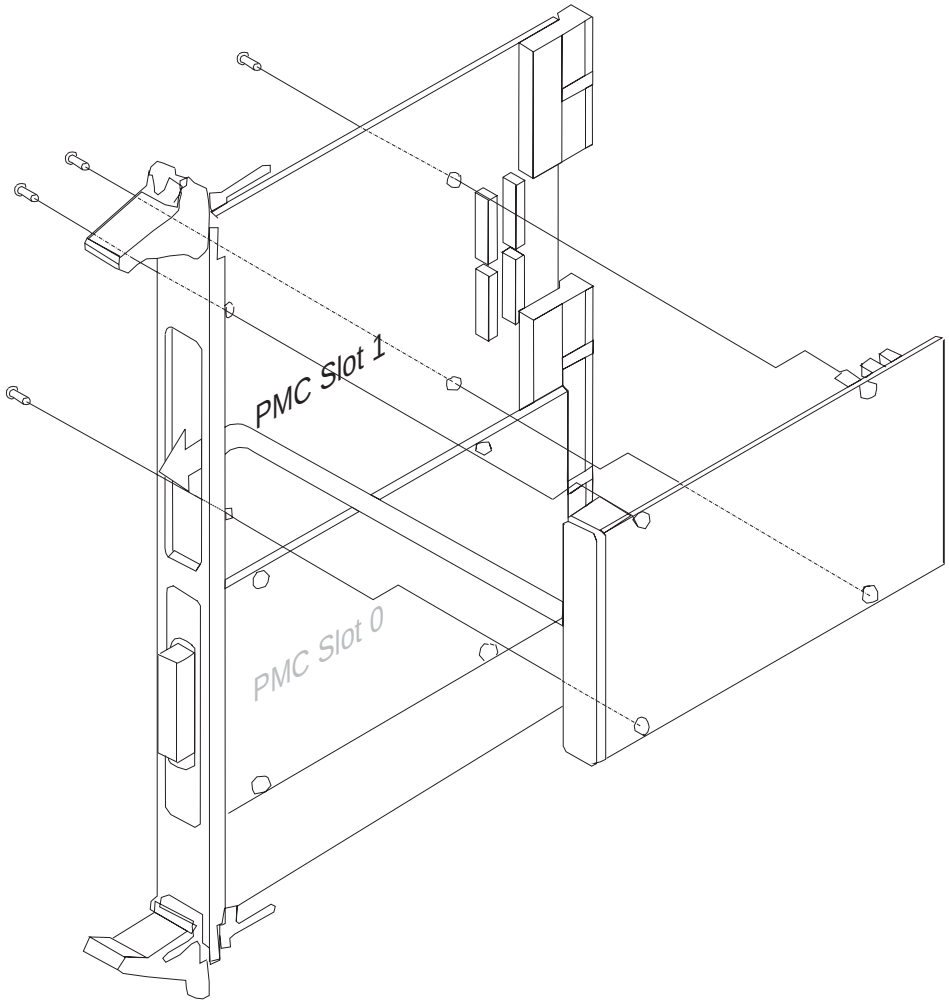

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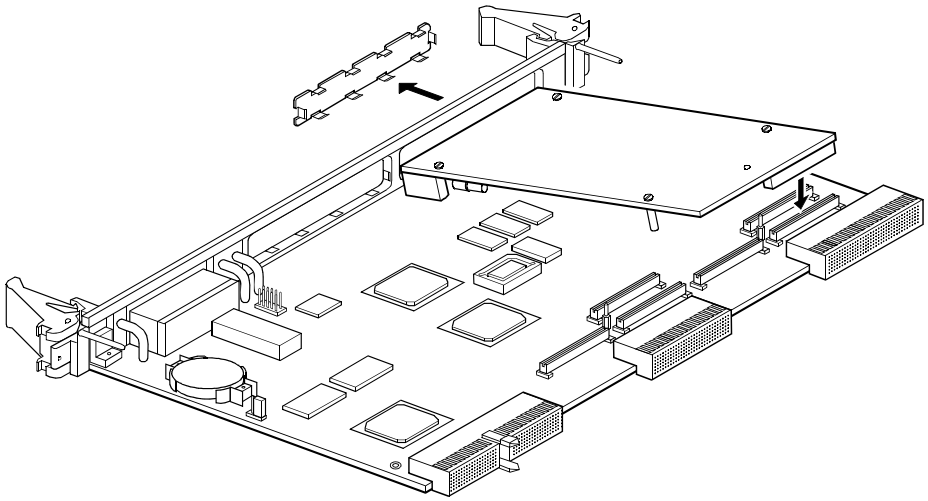
Figure 2-4 Installation of the PMC Module into an Emerson CPV3060



4. Touch a metal part of the computer chassis, remove the graphics board from its anti static bag, and immediately slip it into the slot. After ensuring that the board is seated correctly, install the mounting screws (two near the front and two near the PMC connectors).

Note

Sometimes the graphics board front panel can hang up going into the carrier front panel hole. This can be because there is a little rubber EMI gasket that is installed in a slot cut into the graphics board front panel. If the hole in the carrier board is “on the small side” it can be difficult if not impossible to install the graphics board. In this case, you will have to remove and discard the gasket.

5. Close the computer.

Now, go to Section 2.7.

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2.5 Eclipse3PCI Board Installation

The Eclipse3PCI board is “Universal PCI” device and is designed to plug into any standard PCI 2.2 specification compatible backplane. Although it is a 32-bit device, it includes the 64-bit expansion connector to take advantage of the extra power and ground pins (no signals are used). It can be plugged into a slot which uses either 5V or 3.3V signaling protocol.

Note:

The Eclipse3PCI boards require both 3.3V and 5V. Most AT style motherboards do not supply 3.3V to the PCI connectors. If the computer is listed as PCI 2.0 or 2.1 compliant, it probably does not supply 3.3V.

By special order, Rastergraf can supply the graphics board with a local 3.3V regulator installed. Please contact Rastergraf for assistance.

Installing the PCI Graphics Board

Note:

Refer to ***Section 2.3.3*** for the settings for JP101, JP201, and JP233.

1. Shut down the operating system and **turn off the power**.

Warning!

Never open the computer without turning off the power supply. Unless internal AC wiring is exposed, leave the power cord plugged in, so as to ground the computer chassis. You can easily get shocked, ruin computer parts or both unless you turn off the power. Even with power switched off, lethal voltages can exist in the equipment.

2. Open the computer and find an empty PCI slot.

   When installing the card you have to watch out because the slot (see Figure 2-5) between the 32-bit and 64-bit parts of the PCB connector is quite narrow. PCs sometimes have PCI connectors that have overly thick moldings, requiring the slot to be widened. Should you encounter this problem, please contact Rastergraf for assistance.

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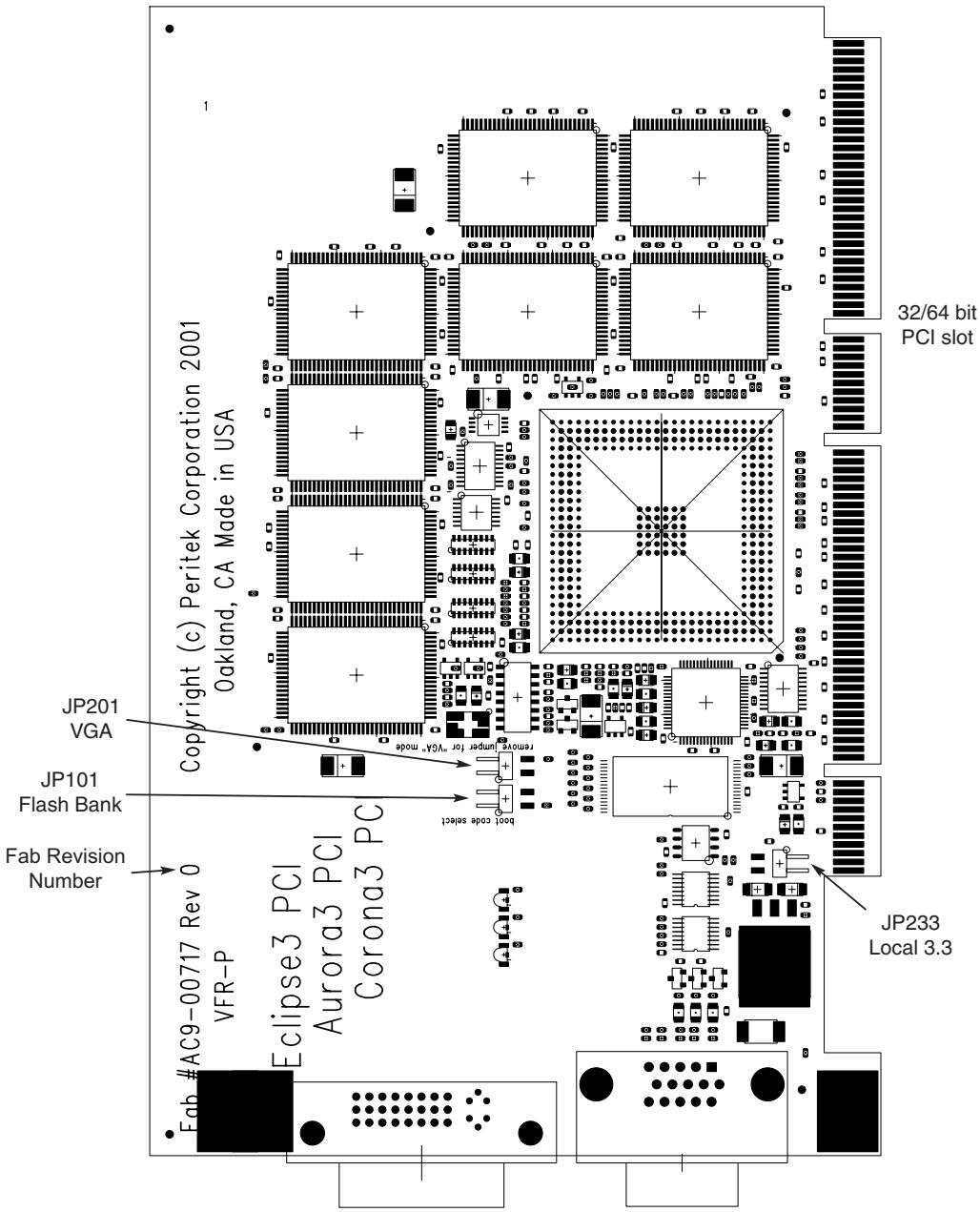
Figure 2-5 Jumper Locations for the Eclipse3PCI Board



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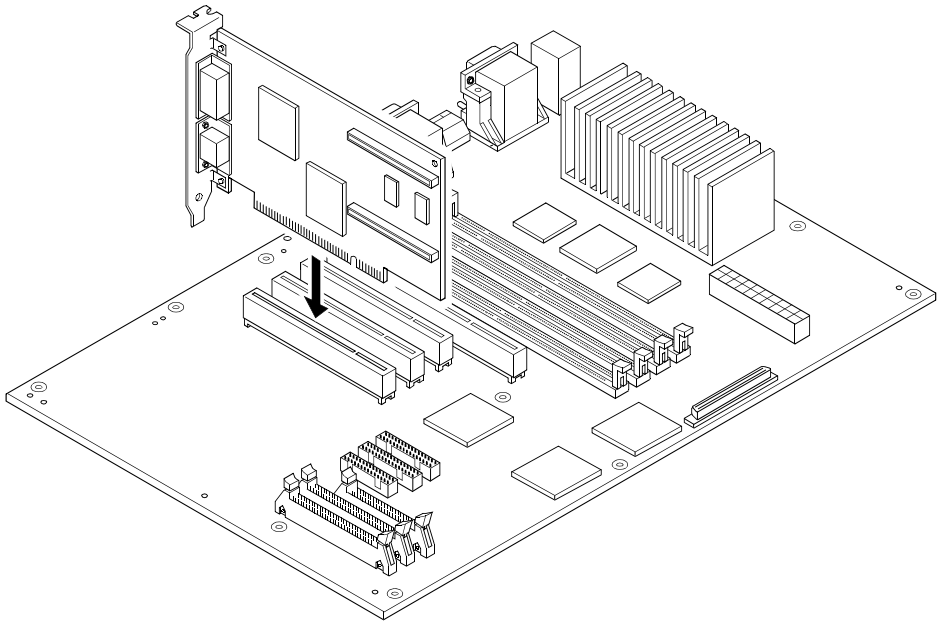
Caution

The static electricity that your body builds up normally can seriously damage the components on the graphics board.

3. Wear a grounded wrist strap and touch a metal part of the computer chassis. Remove the card slot blocking plate from the chassis. Then, remove the graphics board from its anti static bag, and immediately slide it into the slot.

Figure 2-6 Installation of a PCI Module into an Emerson MTX



4. After making sure the board is seated correctly, install the screw into the place where the blocking plate was and which (now) holds the graphics board's front panel
5. Close the computer.

Now, go to Section 2.7

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2.6 Eclipse3CPCI Board Installation

The Eclipse3CPCI board can plug into any 32-bit, 5V or 3.3V signaling CompactPCI 3U or 6U slot. Although the board is usually supplied with a 6U faceplate, a 3U faceplate is also available. The board uses only the J1 connector unless the Rear I/O option is included.

Installing the Graphics Board

> **Note:**
>
> Refer to ***Section 2.3.3*** for the settings for JP101, JP102, and JP201.

1. Shut down the operating system and **turn off the power**.

> **Warning!**
>
> Never open the computer without turning off the power supply. Unless internal AC wiring is exposed, leave the power cord plugged in, so as to ground the computer chassis. You can easily get shocked, ruin computer parts or both unless you turn off the power. Even with power switched off, lethal voltages can exist in the equipment.

2. Open the computer and identify the empty slot in the card cage that is closest to the CPU. Do not leave any slots empty between the graphics board and the CPU.

   The Eclipse3CPCI board is a Universal PCI device and can be plugged into a slot which uses either 5V or 3.3V signaling protocol. Therefore, a J1 connector signaling key plug is not necessary.

3. In the interest of allowing air flow, and if you have a choice, block off any unused slots in the cardcage so that fan air will not flow through them.

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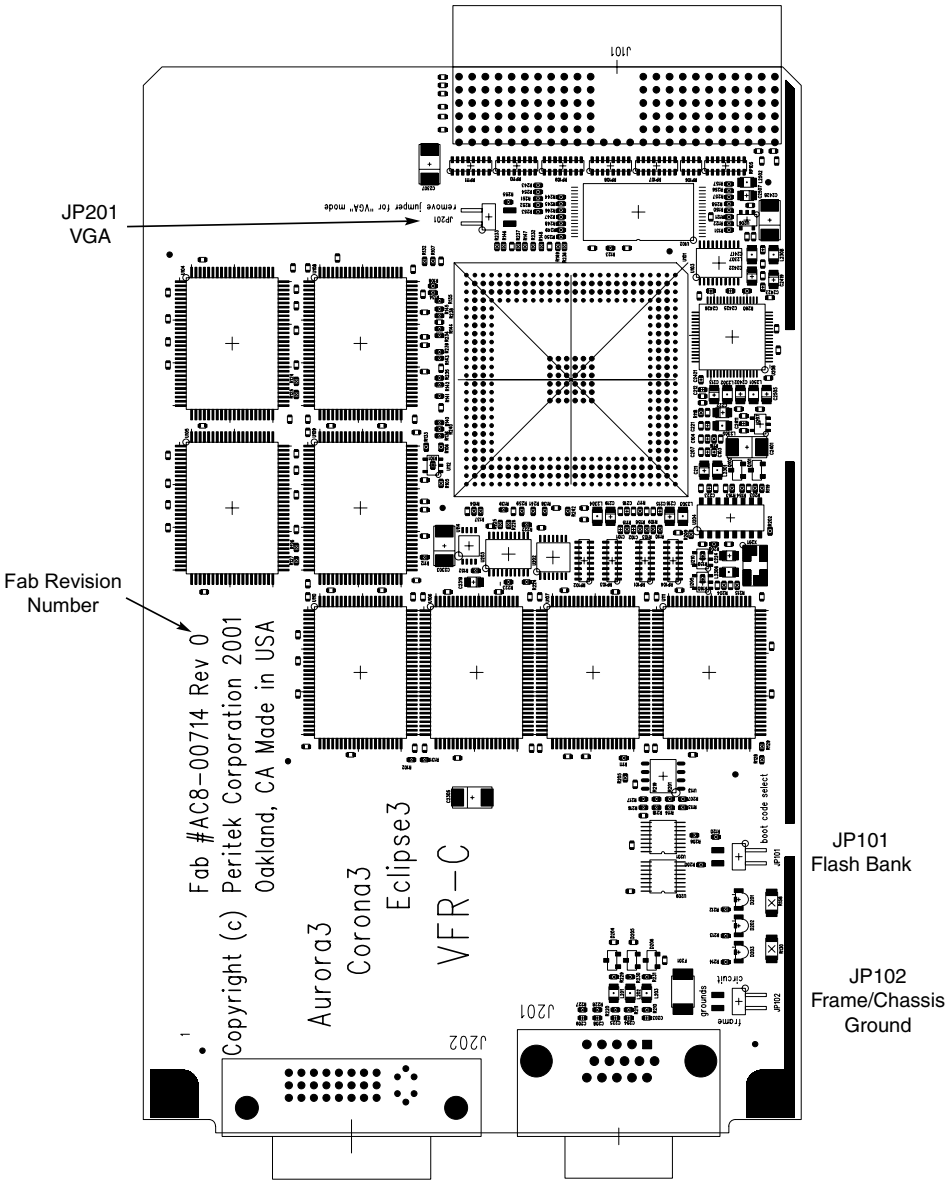
Figure 2-7 Jumper Locations for the Eclipse3CPCI Board



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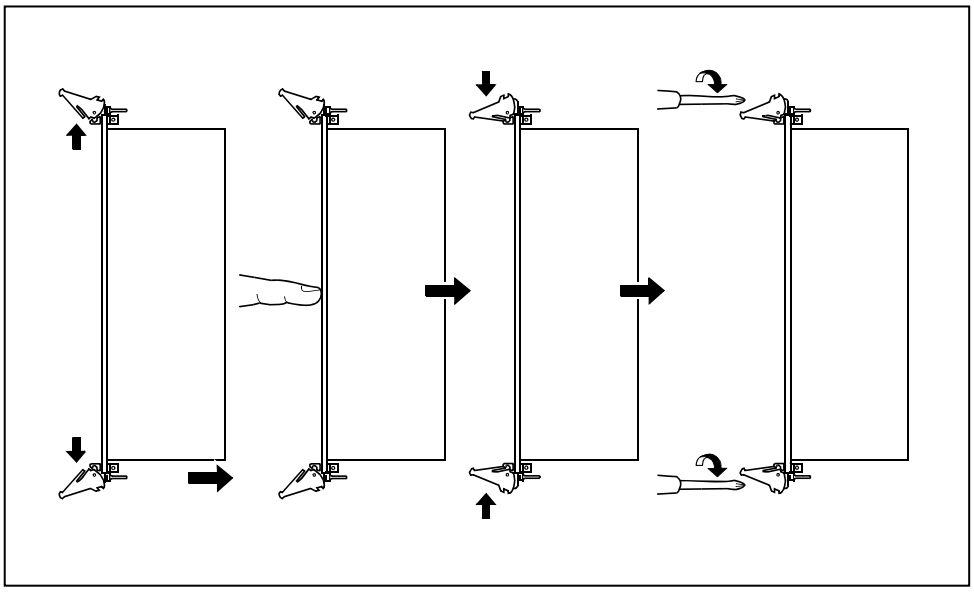
Caution

The static electricity that your body builds up normally can seriously damage the components on the graphics board.

4. Wear a grounded wrist strap. Touch a metal part of the computer chassis, remove the graphics board from its anti static bag, and immediately slide it into the slot.

Figure 2-8 Installing a CompactPCI Board



5. After making sure the board is seated correctly, lever the card in with the injector(s) and tighten the screwlock on each end of the faceplate.

Now, go to Section 2.7.

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2.7 Finishing the Installation

2.7.1 Connecting to the Monitor

If you have an Eclipse3 Standard version board, plug a VGA cable into the VGA compatible front panel connector.

If you have an DVI option board, use either a Rastergraf supplied breakout cable or your own cable solution and plug into the DVI-I connector on the graphics board's front panel. You can use either a VGA (analog) or digital (DVI) compatible monitor.

In either case, be sure to snug the connector's thumbscrews down, as it may otherwise work loose and cause unreliable operation. Make sure that the 75 ohm switch on the monitor, if there is one, is turned on.

2.7.2 Checking your Display

> **Note**
>
> The Eclipse3 boards can supply 3 Wire (RGB with sync on green, BNC connectors) or 5 Wire Video (RGBHV, VGA connector). Rastergraf software defaults to 5 Wire Video (NO sync on green).
>
> Be aware that if you connect a board that has video parameters set up for sync on green to a VGA compatible monitor you will get a green background on the display.

Another minor detail:

The Eclipse3 board may, depending on its original configuration as supplied by Rastergraf, have its BIOS PROM programmed with VGA BIOS, Sun SPARC compatible FCode, or, most commonly, both.

In the two former cases, obviously you can only use the board in a PC or SPARC, respectively. In the latter case, you should be able to use the board in either a PC or SPARC, and the system BIOS or OpenBoot should figure out what to do.

Now, turn on the power and check your monitor's display and proceed.

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2.8 Using an Eclipse3 Board in a PC

2.8.1 Multiboard Operation

The Windows 2000 and Windows XP drivers and Linux SDL and X Free 86 4.2 support multihead operation.

Single Graphics Board

If you are using a PC and the Rastergraf board is to be the system display (and you don't have another VGA controller installed), the system BIOS should find the Rastergraf board, and initialize the display.

Multiple Graphics Boards

If you do have another VGA board in the system, the order in which the boards are plugged into the backplane or motherboard will determine which board will be used for the system display. If the BIOS picks the wrong one, turn off the computer and swap the boards' positions.

If your system has a non-removable VGA controller and you want to use the Rastergraf board as the system display you may have a problem. If the BIOS starts up using the built-in VGA, you may be able to disable it with a BIOS setting. Otherwise, contact the system board manufacturer. Failing these things, you are probably out of luck.

2.8.2 Rastergraf Quad Image BIOS VGA Image

The Rastergraf E3 boards feature four 32KB BIOS images, suitable for both x86 (Windows, DOS, Linux) and FCode (Sun). The images conform to the PCI R2.2 Expansion ROM specification. The PROM is organized as VGA, FCode, VGA with Sync-On-Green, and FCode with Sync-On-Green for a total size of 128KB. For maximum compatibility with non-compliant systems the x86 image precedes the FCode image.

The Sync-On-Green jumper selects the one or the other half of the PROM. On boot up the system BIOS locates and runs the appropriate ROM code. Note: not all E3 boards have the jumper pins installed. Check with your sales representative if you need this feature.

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x86 Image Features:

Support for the 16 standard DOS modes as well as 25 extended VESA modes. See the complete list below. Other extended VESA modes may be added in the future. All standard DOS, VESA and VESA32 functions are supported including DVI, refresh rate, power management and DDC.

The Sync-On-Green modes supports the standard DOS modes with "XOR" composite sync and VESA modes with true serrated / equalized composite sync with pedestal. This is a separate image, selectable by the JP101 jumper.

The BIOS code will search for and initialize the DVI chip, if that option is installed on the E3 board. The DVI output is simultaneous with the analog output, so either monitor plugged into the E3 will work. In the case of Sync-On-Green image and the E3 has the DVI option installed and a DVI monitor is connected then the Sync-On-Green will be disabled, as it is not compatible with DVI. If a DVI monitor is not detected Sync-On-Green will not be disabled, but if a DVI monitor is later connected it may not display properly.

During boot, the BIOS will display a message screen for 10 seconds before relinquishing control back to the system BIOS. This screen will identify the Borealis board BIOS, the revision and build date, and copyright Rastergraf Corp. Additional messages will be displayed if a DVI option is found, if a DVI monitor is connected, if it is a Sync-On- Green image, if the Sync-On-Green is disabled due to a DVI monitor being detected, and a warning if the motherboard is found to not be fully PCI compliant. Other diagnostic messages may be added in the future.

A TSR image is also available. In the case of booting DOS this allows switching to a different (e.g. more current) version after boot, or switching to or from Sync-on-Green mode. This is recommended for testing only, the longer term action is to reprogram the image, which can be done at the factory, or in the field in some cases.

Note that both analog (RGB) and DVI are supported by the BIOS code. Connection to a DVI monitor is detected and the appropriate register values are set without the need to have the user set any special flags or jumpers.

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Table 2-1 x86 Supported Video Modes

Type	Code	Text	Graphics	Color Range	PC Mode
DOS	0x00,1	40x25	--	4 bits per pixel	CGA
DOS	0x02,3	80x25		2 bits per pixel	CGA
DOS	0x04,5	40x25	320x200	4 bits per pixel	CGA
DOS	0x06	80x25	640x200	monochrome	CGA
DOS	0x07	80x25	--	monochrome	MDA
DOS	0x0D	40x25	320x200	4 bits per pixel	EGA
DOS	0x0E	80x25	640x200	4 bits per pixel	EGA
DOS	0x0F	80x25	640x350	monochrome	EGA
DOS	0x10	80x25	640x200	4 bits per pixel	EGA
DOS	0x11	80x30	640x480	monochrome	VGA
DOS	0x12	80x30	640x480	4 bits per pixel	VGA
DOS	0x13	40x25	320x200	8 bits per pixel	VGA
DOS	0x6A	--	800x600	4 bits per pixel	SVGA

Type	Code		Graphics	Color Range	PC Type
VESA	0x0100		640 x 400	8 bits per pixel	--
VESA	0x0101		640 x 480	8 bits per pixel	VGA
VESA	0x0103		800 x 600	8 bits per pixel	SVGA
VESA	0x0105		1024 x 768	8 bits per pixel	UVGA
VESA	0x0107		1280 x 1024	8 bits per pixel	SXGA
VESA	0x0110		640 x 480	15 bits per pixel	VGA
VESA	0x0111		640 x 480	16 bits per pixel	VGA
VESA	0x0112		640 x 480	32 bits per pixel	VGA
VESA	0x0113		800 x 600	15 bits per pixel	SVGA
VESA	0x0114		800 x 600	16 bits per pixel	SVGA
VESA	0x0115		800 x 600	32 bits per pixel	SVGA
VESA	0x0116		1024 x 768	15 bits per pixel	UVGA
VESA	0x0117		1024 x 768	16 bits per pixel	UVGA
VESA	0x0118		1024 x 768	32 bits per pixel	UVGA
VESA	0x0119		1280 x 1024	15 bits per pixel	SXGA
VESA	0x011a		1280 x 1024	16 bits per pixel	SXGA
VESA	0x011b		1280 x 1024	32 bits per pixel	SXGA
VESA	0x0120		1600 x 1200	8 bits per pixel	UXGA
VESA	0x0121		1600 x 1200	15 bits per pixel	UXGA
VESA	0x0122		1600 x 1200	16 bits per pixel	UXGA
VESA	0x0123		1600 x 1200	32 bits per pixel	UXGA
VESA	0x0124		1152 x 864	8 bits per pixel	Sun
VESA	0x0125		1152 x 864	15 bits per pixel	Sun
VESA	0x0126		1152 x 864	16 bits per pixel	Sun
VESA	0x0127		1152 x 864	32 bits per pixel	Sun

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2.9 Using an Eclipse3 Board in a SPARC CPU

2.9.1 Multiboard Operation

The Rastergraf loadable DDX module supports multihead operation under Solaris 8 with Xinerama.

If you are running on a Sun system, you should have the Rastergraf OpenBoot FCode image loaded into the graphics board. This will enable OpenBoot to correctly identify the graphics board on startup and use it as the console.

Single Graphics Board

If the Rastergraf board is to be the system display (and you don't have another display board installed), OpenBoot should find the Rastergraf board, and initialize the display.

Multiple Graphics Boards

If you do have another display board in the system, the order in which the boards are plugged into the backplane or motherboard will determine which board will be used for the system display. If OpenBoot picks the wrong one, swap cables or turn power off and swap the boards' positions.

If your system has a non-removable VGA controller and you want to use the Rastergraf board as the system display you may have a problem. If OpenBoot starts up using the built-in VGA, you may be able to disable it with an OpenBoot EEPROM setting. Otherwise, contact the system board manufacturer. Failing these things, you are probably out of luck.

2.9.2 Using OpenBoot and the Rastergraf FCode on Eclipse3

Eclipse3 has the capability to function as a console device using the embedded OpenBoot FCode firmware programmed into the Eclipse3 board.

The display defaults to 1152 x 864 @ 60hz, 8 bits per pixel with separate horizontal and vertical sync signals and black text on a white background. Please skip to Section 2.13 if you do not wish to change the default (startup) appearance of the display.

Note that both analog (RGB) and DVI are supported by the BIOS code. Connection to a DVI monitor is detected and the appropriate register values are set without the need to have the user set any special flags or jumpers.

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2.9.2.1 Getting Ready to Make the Changes

If you are running Solaris, shutdown and halt the CPU until the OpenBoot prompt (ok) appears.

Then, disable the CPU from automatically booting until the configuration process is completed:

```
ok setenv auto-boot? false
```

Set the OpenBoot input and output devices to recognize Eclipse.

```
ok setenv input-device keyboard
ok setenv output-device screen
```

2.9.2.2 NVEDIT Command Summary

The next section makes use of the OpenBoot ***nvedit*** utility to change the default settings for the Rastergraf FCode that are maintained in the ***nvramrc*** file by OpenBoot.

NVEDIT Commands

`Ctrl-N`	Go to the next line
`Ctrl-P`	Go to the previous line
`Ctrl-A`	Go to the beginning of a line
`Ctrl-L`	List the entire contents
`Ctrl-K`	Deletes a line
`Ctrl-C`	Exits the editor

Hitting the <Enter> key while in nvedit causes a new empty line to be inserted in the nvramrc.

Important Note: in order for the changes that have been made in nvram to take effect some processor boards (e.g., the Themis UltraSparcII) may require the following to be added as the **last** line of the nvramrc.

```
probe-all install-console banner
```


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2.9.2.3 Setting the Console Resolution

The initial system default console resolution of the Eclipse3 is 8 bits per pixel, 1152 x 864 @ 60Hz. The Eclipse3 is capable of supporting additional console mode resolutions (all are 8 bpp) as shown in the following table:

Table 2-2 FCode Supported Display Modes

Index	Graphics	Refresh Rate	PC Type
0	1024 x 768	60 Hz	UVGA
1	1024 x 768	75 Hz	UVGA
2 *	1152 x 864	60 Hz	Sun
3	1152 x 864	75 Hz	Sun
4	1280 x 1024	60 Hz	SXGA
5	1280 x 1024	75 Hz	SXGA
6	800 x 600	60 Hz	SVGA
7	800 x 600	75 Hz	SVGA
8	640 x 480	60 Hz	VGA
9	640 x 480	75 Hz	VGA
a	1152 x 900	60 Hz	Sun (old)
b	1152 x 900	75 Hz	Sun (old)
c	1600 x 1200	60 Hz	UXGA
d	1920 x 1200	60 Hz	WUXGA

*** - initial system default**

To change the startup console display mode, identify the desired graphics resolution and refresh rate and enter the corresponding index value (e.g, 6 is the index value for 800 x 600 @ 60hz) in place of the word ***index***, as shown in the below.

```
[at the ok prompt]
type    nvedit
receive 0:      [if, instead, you receive 0: and some text, type <ctrl-k> to clear the line]
type    index constant eclipse3-console-mode <return>
receive 1:      [if, instead, you receive 1: and some text, just ignore it]
type    ^C
receive ok
type    nvstore
receive ok
```


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2.9.2.4 Setting the Sync Mode

The initial system default sync signal output type of Eclipse3 is separate, positive polarity. Eclipse3 is capable of generating additional sync output signals as shown in the following table:

Table 2-3 FCode Sync Output Modes

Mode	Sync Mode	Horizontal Polarity	Vertical Polarity	Blanking Pedestal	Install JP101
0*	Separate	positive	positive	n/a	no
1	Separate	positive	negative	n/a	no
2	Separate	negative	positive	n/a	no
3	Separate	negative	negative	n/a	no
4	Composite	negative	negative	n/a	no
5	Reserved	Reserved	Reserved	Reserved	Reserved
6	Sync on Green	negative	negative	yes	yes
7	Sync on Green	negative	negative	no	yes

*** - initial system default**

If you do not wish to change the display mode, please skip to the next section.

To change the startup sync output mode, identify the desired sync output mode and enter the corresponding index value (e.g, 6 is the index value for Sync On Green with Blanking Pedestal) in place of the word ***mode***, as shown below.

```
[at the ok prompt]
type    nvedit
receive 0: <index> constant eclipse3-console-mode
        [if, instead, you receive 0: but no text, it means that the console mode is not set]
type    <return>
receive 1:      [if, instead, you receive 1: and some text, type <ctrl-k> to clear the line]
type    mode constant eclipse3-console-sync <return>
receive 2:      [if, instead, you receive 2: and some text, just ignore it]
type    ^C
receive ok
type    nvstore
receive ok
```


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2.9.2.5 Setting the Console Background and Text Display Appearance

The initial system default console background and text display appearance is **Black Text on a White Background.**. Alternatively, White Text on a Black Background (it will look like this: Eclipse3).

To change the appearance, enter the new mode (0 for Black Text, 1 for White Text) in place of the word ***appear*****,** as shown below.

```
[at the ok prompt]
type    nvedit
receive 0: <index> constant eclipse3-console-mode
        [if, instead, you receive 0: but no text, it means that the console mode is not set]
type    <return>
receive 1: <mode> constant eclipse3-console-sync
        [if, instead, you receive 1: but no text, it means that the console sync is not set]
type    <return>
receive 2:      [if, instead, you receive 2: and some text, type <ctrl-k> to clear the line]
type    appear constant eclipse3-console-background <return>
receive 3:      [if, instead, you receive 3: and some text, just ignore it]
type    ^C
receive ok
type    nvstore
receive ok
```

2.9.2.6 Activating Eclipse3 Console Mode Features

To display the nvramrc contents:

```
[at the ok prompt]
type    printenv nvramrc
receive 0: <index> constant eclipse3-console-mode
receive 1: <mode> constant eclipse3-console-sync
receive 1: <appear> constant eclipse3-console-background
```

`<index>`, `<mode>` and `<appear>` will be the values you entered. Now, make OpenBoot to use the information contained within nvram:

```
type    ^C
receive ok
type    setenv use-nvramrc? true
receive ok
type    reset
```


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2.10 Using an Eclipse3 Board in a PowerPC

If the CPU's on-board firmware is VGA aware, it should initialize the graphics board and use it as the system console. However, many PowerPC (PPC) based computers don't have generic VGA support. Newer ones are not "chrp" or "prep" compliant anymore, so they don't know about FCode. Your best bet is to use a board with a VGA BIOS in it.

Otherwise, you will have to boot using a serial terminal and only after the graphics software has been installed and run will you see anything.

2.11 Final Checks

If you are running in a PC, then you should get the usual PC displays. If you have multiple graphics boards installed, only one will be initialized by the BIOS. Once you have installed the Windows NT/2K/XP multihead drivers and reboot, all screens will be initialized as the OS boots.

In the case of X Windows, your monitor should display a uniform stippled raster and a cross-hair cursor, which is controlled by the mouse. If you have multiple graphics boards installed, all screens will be initialized and display the stipple once you have the server installed and running.

For SDL, demo programs are provided that may be run to put test patterns on the screen(s).

Pictures!

Once you have a picture on the screen, you may need to adjust the width, height, brightness, contrast, and hold controls on your monitor to get a good, centered image. If these controls don’t adjust the image properly, the parameters used to set the graphics timing registers might be wrong. If you have any trouble with any part of the installation call or email Rastergraf for assistance, or refer to Chapter 4.

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Chapter 3 Programming On-board Devices

3.1 Introduction

This chapter covers the special programming features of the individual devices used on the Eclipse3. It is intended to supply information unique to the board or to the application of a particular chip. Section 1.3 provides a list of appropriate publications that include manufacturer's data sheets and manuals.

Rastergraf offers a variety of software to support the Eclipse3 graphics boards in Solaris, Windows 2000, and XP, VxWorks, and Linux. These offerings are covered in detail on the Rastergraf web page.

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Note

Please read these sections **before** starting on this chapter:

Section 1.2	Functional description of the Eclipse3 boards.
Chapter 2	Installation

This chapter includes the following other sections:

3.2 Borealis Graphics Accelerator
3.3 Synchronous Graphics RAM (SGRAM)
3.4 Borealis Clocks
3.5 Video Timing Parameters
3.6 Eclipse3 Auxiliary Registers
3.7 System Management Devices
3.8 Talk to Me Through I^2C
3.9 DVI Digital Video Output
3.10 Flash EEPROM
3.11 Serial EEPROM
3.12 Interrupts

Because the Eclipse3 is mostly an assembly of “black box” parts, there isn’t a lot of external logic that has to be documented. Thus, the following sections don’t actually provide much programming information, as the chip documentation and SDL device support cover that pretty well. The sections summarize the devices and include some “hints and kinks”.

You can refer to the **Rastergraf web site** for complete documentation. You can also license the Rastergraf SDL source code itself.

The following sections assume that you have read Section I.2 and have some knowledge of video, graphics, the PCI bus and the I^2C protocol. For detailed information concerning operation of the PCI bus, please refer to the Section 1.3, Additional References.

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3.2 Borealis Graphics Accelerator

> **Note**
>
> The ***Borealis Technical Manual*** is available from Rastergraf under NDA.

3.2.1 Introduction

This section describes the architecture and includes a block diagram for Borealis high performance graphics controller, which includes a 33/66 MHz PCI compliant interface with no additional external logic required.

Please see the following page for a Block Diagram of the Borealis.

Software may interact with Borealis by directly manipulating pixels through the frame buffer interface or by the Borealis3D's highly pipelined graphic processor architecture. This architecture allows for high performance 2D and 3D Rendering. After a sequence of commands and parameters are written, Borealis executes the selected command without any further host processor intervention.

3.2.2 Host Bus Interface

The Host Bus Interface provides an interface to the PCI system bus. It implements a full PCI slave interface, responding to reads and writes of configuration, memory, and I/O cycles. It also implements a PCI master interface for specific memory writes. It also generates peripheral bus control for flash EPROM.

3.2.3 Frame Buffer

Borealis supports one local frame buffer of up to 32 MB with a data bus width of 128 bits to SGRAM memory. The local buffer may be used as a display buffer, as well as off-screen memory to be used for the storage and manipulation of bitmaps, texture maps, Z buffering or fonts. The buffer may be accessed as a linear buffer through the Frame Buffer interface or through the drawing engine.

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Block Diagram

Borealis is partitioned into the following functional sections:

- Host Bus Interface
- Aperture Controller
- Drawing Engine
- CRT Controller
- Memory Controller
- Internal VGA
- Internal RAMDAC

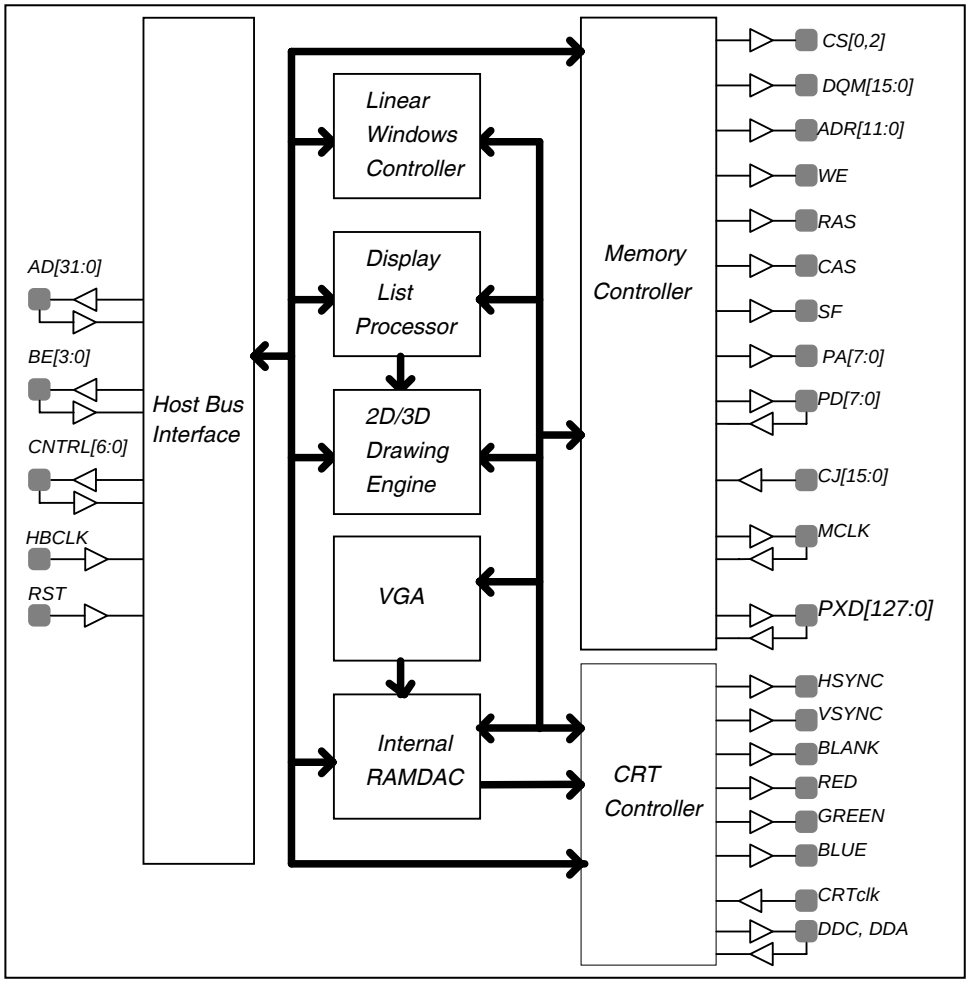

Figure 3-1 Borealis Block Diagram

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3.2.4 Linear Windows Controller

The Linear Windows Controller provides address decoding, address translation, color space conversion between the host interface and the local memory system. It also provides a mechanism for caching reads and writes from the host bus to the local buffers. In write mode, up to eight 32 bit words may be written to the host bus cache. The cache continuously monitors the address of each word written to determine if they are in the same page. If the words are not in the same page, or if the cache word count reaches eight, the cache will request the required number of memory writes from the Memory Controller. At this time the cache controller swaps access to its second cache and continues to accept host writes. If another page fault is detected during the secondary cache fill, a system stall will occur. This situation can be avoided by testing the cache and by doing cache line fills. During reads latency will be incurred for initial accesses or any page fault conditions. Software should make an effort to maintain scan line coherency during any access to the local buffers for optimal performance.

3.2.5 Drawing Engine

The Drawing Engine provides all the required logic to implement BITBLT, LINE, LINE_3D, TRIAN_3D, and HOST XFER commands. The Drawing Engine, when triggered, transfers command and parameter information from the host accessible registers to its own local working registers where it begins its setup phase. When the Drawing Engine is done with its setup, it begins the execution of a specific algorithm for the associated command.

For non-rendering commands, after the setup phase, the Drawing Engine begins requesting memory access from the Memory Controller. For 2D and/or 3D rendering commands, the object is piped through the algorithmic rendering engine which begins requesting memory access from the Memory Controller as soon as the first pixel/texel is generated. Up to 2 rendering commands can be piped through the rendering engine at the same time.

If read data is requested, the memory controller will control the loading of the data into the Drawing Data path and will notify the Drawing Engine that the data is now available. If write data is requested, the data will have been previously setup in the drawing data path and the Memory Controller will control the output of that data to the selected memory buffer.

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3.2.6 Display List Processor

The Display List Processor (DLP) is used to feed a set of commands to the Drawing Engine. The DLP uses a 128-bit instruction word. The instruction formats allow for each word to write up to three Drawing Engine registers or two text glyphs. There is a four register mode which only writes XY0, XY1, XY2, and XY3. This mode cannot be mixed with any other mode.

3.2.7 CRT Controller

The CRT Controller provides programmable CRT timing signals: horizontal, vertical blanks and syncs. It is also responsible for generating requests to the memory controller for screen refresh cycles. A free running frame counter which generates interrupts to the Host is also provided. This is useful for synchronizing bit map copies. CRT Controller also provides display refresh data for the internal RAMDAC.

3.2.8 Memory Controller

The Memory Controller arbitrates and controls all access to the local memory buffer by the Host Interface, the CRT controller, and the Drawing Engine. This unit provides support for SGRAM memory.

3.2.9 VGA Core

The Borealis incorporates an IBM-compatible VGA core. The VGA core implements the standard VGA register set for the various VGA components (CRT controller, sequencer, graphics controller, attribute controller, etc.) and is capable generating the standard VGA modes (00h - 07h, 00h - 13h). The control of memory and CRT signals can be switched between the VGA core and the Borealis. The VGA memory space is shared with the Borealis frame buffer and is sparsely mapped within it.

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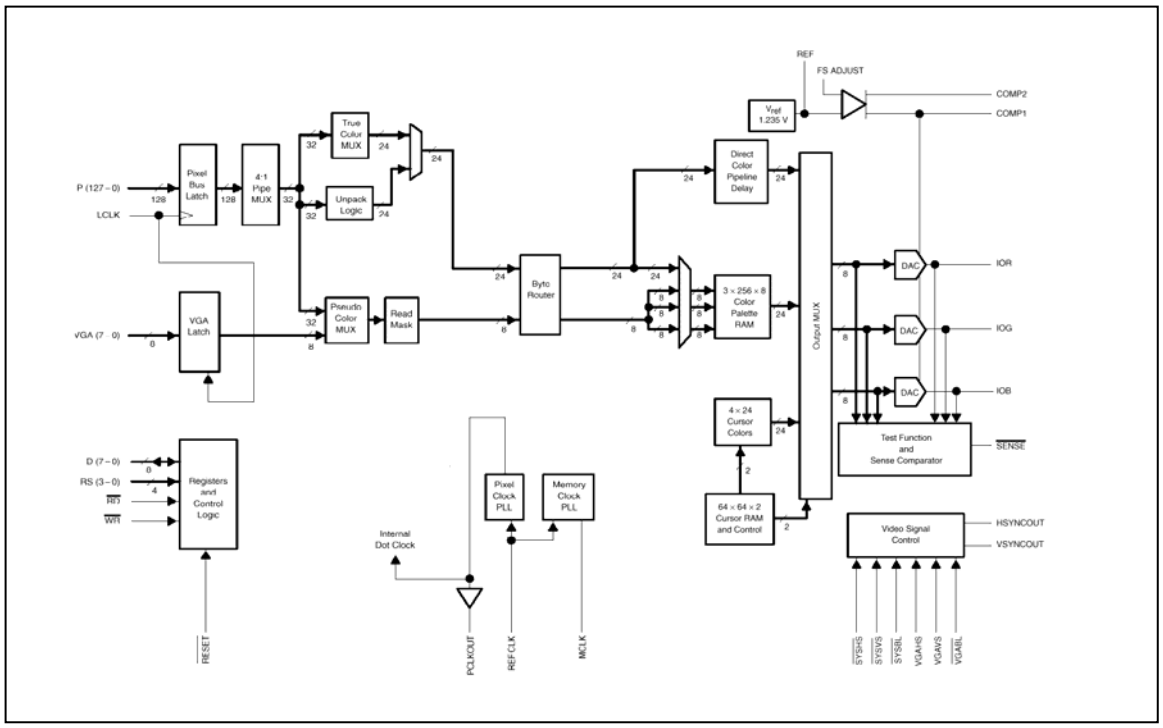
3.2.10 Internal RAMDAC and PLL Clock Generators

The RAMDAC transforms the raw data from the CRT controller into signals that an analog or digital monitor can understand. In the process, it can add gamma correction and a high resolution cursor. The RAMDAC also provides two programmable clocks which can range from 25 MHz to 250 MHz: one for the memory controller, and the other for the pixel data.

Feature Summary

- 250 MHz operation
- 128-bit > 64-bit multiplexer from the pixel FIFO
- Fine-grained PLL programming optimizes display
- Pixel re-synchronization ensures integrity of all display modes
- Large Screen ISO-compliant refresh rates
- 8/15/16/32-bits per pixel
- 32 bpp Direct Color Gamma correction
- 256-shade gray scale
- Three 256x8 color palette RAMs
- Triple monotonic 8-bit DACs
- 64x64/32x32 translucent hardware cursor
- 100 MHz 8-bit VGA data input
- On-chip diagnostic functions
- Power-down modes

Figure 3-2 Internal RAMDAC Block Diagram



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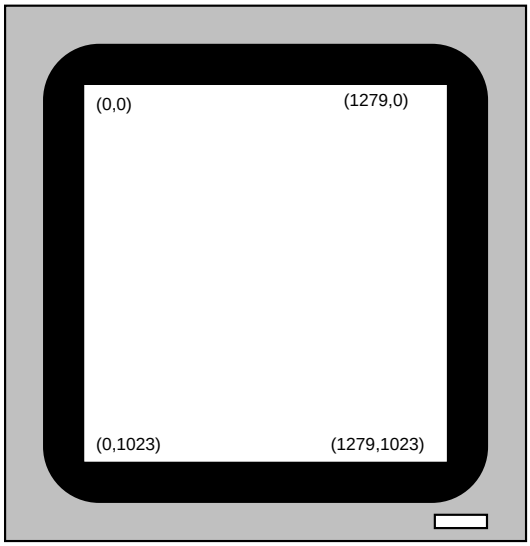
3.2.11 Coordinate System

The screen coordinate system has its origin at the upper left hand corner of the screen, with the X coordinates incrementing left to right and the Y coordinates incrementing top to bottom. The coordinate system for a 1280 by 1024 display is shown in below.



Everything performed in X-Y space is done using 16-bit 2's complement integers. This includes: destination X and Y coordinates, registers that are specified in XY format, and arithmetic operations.

Rendering commands use X and Y coordinates that are specified in IEEE Single Precision Floating Point (***ISPFP***) format and then converted to 16-bit 2's complement integers.

In all cases, no overflows will be detected or reported. Care must be taken for drawing operations not to exceed the 16 bit coordinate space.

The display buffer is accessed in this format by specifying the coordinate, the source and/or destination space origin, and the buffer pitch. From this organization it can be seen that the pitch of the display buffer can be changed on a command by command basis.

The Z buffer can be either 16 bits in 16 bpp mode or 24 bits (packed into the lower 3 bytes of a 4 byte DWORD) in 32 bpp mode. As with the display buffer, the Z buffer can be accessed by specifying the Z buffer origin, Z buffer pitch and the (x,y) coordinate of the Z buffer. The Z values goes through an ***ISPFP*** setup engine and are converted to the appropriate format (16 or 24 bits) before it is stored into the Z buffer.

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3.2.12 Borealis Build Options and Power-up Settings

The Borealis is a “Plug and Pray” device, whose operation depends on the software. Except as documented in ***Section 2.3.3***, there are no user jumpers.

The Technical Manual documents a number of register preloads and functional settings that are determined by 0 ohm resistors installed during manufacturing and read by the Borealis on power up.

Note: Software cannot override the values set by the 0 ohm resistors. Please contact Rastergraf if it is necessary to change a value.

Table 3-1 Borealis Configuration Settings

CJ	In/Out	Function	Default
31	in	PCIBAR 0, 1 address size	
30	out		16 MB video memory
	in		32 MB video memory
29	in	BIOS PROM enable	Enabled
JP201	out	PCI device sub class	VGA
	in		“Other Device”
27	in	SGRAM density	32 Mb x 32 bit wide
26	in		
25	in	Internal RAMDAC	Enabled
24	in	Enable SGRAM	Enabled
23	in	Enable PCI	Enabled
22-20	out	Subsystem ID	Subsystem ID Code CJ19 out for 16 MB Board CJ19 in for 32 MB Board
19	out		16 MB video memory
	in		32 MB video memory
18	in		
17	in		
16	in	Enable Sub. Vendor ID	Enabled
15-13	in	Subsystem Vendor ID	Rastergraf PCI Vendor ID 0x10F0
12	out		
11-8	in		
7-4	out		
3-0	in		

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3.3 Borealis Clocks

The Eclipse3 boards have several clocks.

DECLK is the Borealis Drawing Engine clock and is generated by the CY2292 clock synthesizer. A two frequency select allows the DECLK to be set to 75, 80, 90, or 100 MHz, depending on the operating conditions of the system. The default is 75 MHz.

REFCLK is the Borealis PLL reference clock, and is generated by the CY2292 clock synthesizer. It is fixed at 37.5 MHz.

LDCLK is generated by the Borealis internal video clock PLL. It is an auxiliary clock output (from the Borealis) and is used as the pixel clock for the digital output. One pixel is output for ***each edge*** of LDCLK.

SECLK is the Borealis Setup Engine clock. Its source is selected under program control using a register in the Borealis. The choices include the PCI bus clock and MCLK/2.

VCLK is the Borealis video (pixel) clock and is generated by a PLL internal to the Borealis. It uses the REFCLK as its PLL reference. The pixel frequency can be set to between 25 MHz and 250 MHz.

MCLK is the Borealis memory clock for the Borealis memory controller and SGRAM interface. and is generated by a independent PLL internal to the Borealis. It uses the REFCLK as its PLL reference. The frequency can be set to between 25 MHz and 250 MHz, although the usable memory frequency limit is about 125 MHz.

When the Eclipse3 powers up, MCLK is REFCLK and VCLK is undefined. Once the VGA BIOS (or, if in a non-PC environment, the Eclipse3 graphics software) is executed, the MCLK and VCLK PLLs can be programmed to select higher frequencies in accordance to the desired display format and memory timing.

A consequence of the multi-clock nature of the Borealis is that if you read a register driven by the pixel clock (e.g. VCOUNT), you may get erratic results because the host bus interface uses a different clock. You have to read the register twice, read the comparison flag or use interrupts to get correct results. The reason for this is simple: the VCOUNT register can change state in the middle of a Borealis host read cycle. Its operations are totally asynchronous to the Borealis PCI bus interface clock.

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3.4 Synchronous Graphics RAM (SGRAM)

The display memory chips are expressly designed for high speed graphics applications. These devices are called Synchronous Graphics RAMs (SGRAMs).

The SGRAM replaces the previously used Video RAM, which had a two-port design with separate video output that drove an external RAMDAC. While the VRAM was potentially able to supply substantially better performance than the SGRAM, the price pressures of the PC market made it too expensive.

The SGRAM is a single port device: the random access and video refresh access data all come out on the same data lines, and are routed through the graphics controller. The SGRAM can be built on the same fab line as SDRAM, and, by adding a few graphics-oriented features, combined with building the RAMDAC into the graphics controller, provides a more cost effective solution at a small performance penalty.

The video refresh reads a block of video data into a FIFO in the Borealis which eventually passes the data to the on-chip RAMDAC. Depending on the horizontal line pixel count, the video refresh transfer operation may have to be repeated several times during the raster line time to keep the FIFO filled. The SGRAM is available for random access operations at all other times. There is a small additional overhead time for memory refresh, which occurs about once every 15 us. The SGRAM availability for random access is about 75%. The Borealis uses 32 Mb Samsung K4G323222A-2x512K x 32 SGRAM.

Write-per-bit Registers

SGRAM has a write-per-bit feature that allows bit planes to be selectively write enabled. This feature allows the Borealis to perform write operations instead of read-modify-write operations, which can be a significant performance enhancement. When updated, the Borealis write-per-bit register contents are automatically stored in the SGRAM using the persistent write-per-bit function.

SGRAM Color Register and Block Fill Special Function

The Borealis can use the SGRAM block write and color register special functions. The color register is used in conjunction with the SGRAM block fill mode to enable up to 8 adjacent 32-bit locations in the SGRAM to be written in one cycle. In this way, one can quickly replicate 1-D and 2-D patterns in memory at many times the single pixel rate. Using block write, up to 128 (16 byte data bus * 8 locations/block) 8-bit pixels can be written in each 10 ns page mode cycle, resulting in a 12.8 Gpixel/sec FILL time.

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Display Memory Size

The pixel size is programmable to 8, 15, 16, or 32 bpp. The SGRAM on the Borealis is either 16 MB or 32 MB, where a MB = 1024 * 1024 bytes. Calculate the possible display formats based on these values.

Note that you can render into SGRAM that is not being used in the active display, and by changing the starting address register in the Borealis pan to it so it is visible or BitBLT the Pixmap data to a static display window.

3.5 Eclipse3 Optional Features Register

Although most functions on the Eclipse3 are self-contained, it is necessary to maintain a few extra control bits for supplementary features. Using the Micrel MIC74 I^2C 8-bit I/O register, the graphics board supports an auxiliary register.

All bits come up tristate and have pullups except I2CMUX which has a pull down.

Table 3-2 Eclipse3 ACR Register Bit Assignments

Bit	Mnemonic	Value	Function	Description
0	REDLED	0 1	on off	Red LED
1	AMBLED	0 1	on off	Amber LED
2	GRNLED	0 1	on off	Green LED
3	I2CMUX	1 0	local monitor	Switches the Borealis DDC2B/I2C control lines between local devices (THC63DV164, Serial EEPROM, and LM75) and the display monitor.
5, 4	--	-	not used	--
6	PBSEL	0 1	high bank low bank	Selects between the high and low 64 KB of Flash PROM when JP101 is ***not installed.*** ***JP101(installed) overrides this bit (forces low).***
7	--	-		not used

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3.6 Video Timing Parameters

The Borealis must be programmed to generate the proper video timing for the hardware configuration and display format. Rastergraf 's SDL subroutine library package accepts display format (e.g. 1600 x 1200, 32 bpp) and refresh requirements (e.g. 67 Hz vertical refresh) as parameters to a function call. The software then provides (and loads) a best fit timing profile for the Borealis graphics chip.

Similar display format information is provided in a configuration file for Rastergraf 's PX Windows server.

Does your Display have a Green Cast to it?

By default, the Eclipse3 supplies video in separate (five wire video RGBHV) video format. If you hook the Eclipse3 up to a multiscan monitor with a regular VGA cable then you will be giving RGBHV to the monitor. Be sure to not select sync-on-green in the Eclipse3 video parameters or you will get a green cast to the image.

Table 3-3 Standard Graphics Display Formats

Format Name	Pixel Resolution	Aspect Ratio
QXGA	2048 x 1536	4:3
WUXGA	1920 x 1200	8:5 (HDTV)
UXGA	1600 x 1200	4:3
SXGA+	1400 x 1050	4:3
SXGA	1280 x 1024	5:4
QVGA	1280 x 960	4:3
XGA	1024 x 768	4:3
SVGA	800 x 600	4:3
VGA	640 x 480	4:3

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3.6.1 Application Note: Adjusting the Timing Parameters

Most monitors have adjustments for Horizontal Frequency, Horizontal Position, Horizontal Size, Vertical Frequency, Vertical Position and Vertical Size. It is recommended that the monitor adjustments be tried before trying monitor settings not in accord with the monitor data sheet.

Rastergraf 's SDL software allows you to define the timing parameters in one of two ways:

a) you tell SDL that you are using a multiscan monitor. You specify the display active width and height (e.g. 1600 x 1200) and the Vertical Frequency, and the program figures out the rest.

b) you tell SDL exactly what you want the timing to be. You specify:

- vertical frequency in Hz
- vertical blanking in milliseconds (ms)
- vertical front porch in ms
- vertical sync width in ms
- horizontal blanking in microseconds (us)
- horizontal front porch in us
- horizontal sync width in us
- display width and height

The program derives the horizontal frequency from this information.

Ordinarily, you should be able to use the monitor's data sheet to obtain a satisfactory display. However, it may be that adjustments are required. This section gives you some advice on how to do this. You can also send Rastergraf a filled-in copy of the parameters sheet which follows this section.

Declaration

Rastergraf is dedicated to making your application work. We can assist in determining special video timing parameters for specific monitors and other output devices. If you need help it would be very useful if you can gather the data requested in the following form before calling us.

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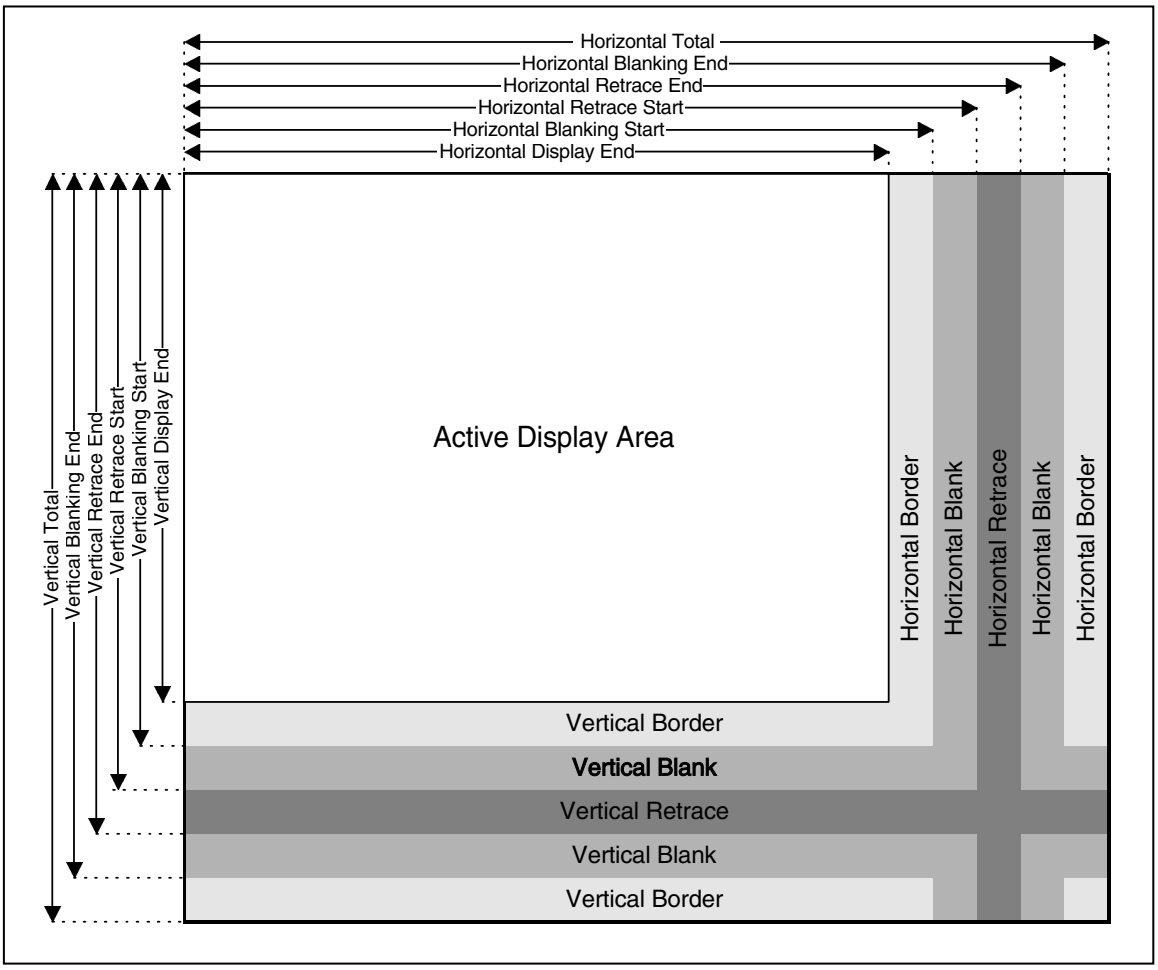
Figure 3-3 Video Display Timing Fields



To change the horizontal frequency:

The horizontal frequency is also known as horizontal refresh or scan rate. Indications that the horizontal frequency needs to be changed are an unviewable picture with diagonal lines or no picture at all. Similar symptoms can be caused by no sync at all, so make sure that the cables are connected. When the sync is incorrect, the number of diagonal lines is an indication of how close to the correct horizontal frequency you are: fewer lines are closer, more lines are farther. Changing the horizontal frequency will also affect the vertical frequency. Decreasing the horizontal frequency will generally result in a wider picture.

To change the horizontal position:

To shift the image *left* **increase** the horizontal front porch by the same amount. Perform the converse procedure to move the image to the *right*.

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To change the vertical frequency:

The vertical frequency is also known as vertical refresh rate or vertical scan rate. Indications that the vertical frequency needs to be changed are a picture which rolls up or down. Sometimes the appearance is of multiple pictures, one on top of another, with multiple horizontal lines. A very slow vertical frequency will cause the image to flicker. Some monitors display no picture when the vertical frequency is out of its bandwidth. Since the same symptoms can be caused by no sync at all, make sure that the cable is connected correctly and that the monitor is configured correctly.

To change the vertical position:

To shift the image *up* **increase** the vertical front porch by the same amount. Perform the converse procedure to move the image *downward*.

To change the height of the image:

There are two ways to change the height (vertical size) of the image.

1) Change the number of lines. The image aspect ratio remains the same.
2) Change the vertical frequency but keep the horizontal the same. Decreasing the vertical frequency will result in a shorter image, increasing it will result in a taller image.

To change the width of the image:

The best way to change the width of the image is to change the pixel clock frequency. If you want to change the pixel clock but not any other timing parameters, then increasing the frequency will result in a narrower image and decreasing it will result in a wider image While there are ways to change the width (horizontal size) of the image without changing the pixel clock, they affect other timing parameters and can lead to complications.

> **Note:**
>
> To keep the timing intervals the same when changing the pixel clock you have to enter new horizontal timing parameters.

3.6.2 Pan and Scroll

Panning and scrolling (also called roaming) are techniques used to provide a window into a larger memory than can be displayed. The display X (pan) and Y (scroll) starting points are changed, allowing new data areas to be displayed. A 16 MB board with a 1280 x 1024 x 8 bpp format gives you ***almost thirteen*** full screens to roam around in.

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3.6.3 Request for Help in Determining Video Timing Values

Use the following table to request help when you have a non-standard video timing requirement.

Table 3-4 Eclipse3 Video Timing Parameter Request Form

Submit to: Rastergraf Technical Support
Fax (541) 923-6475 or email: support@rastergraf.com

Company Information
Company Name_____
Contact_____
Phone Number_____
Fax Number_____
email_____

Monitor Information
Monitor Brand_____ Model Number_____

Eclipse3 Information
Model Number_____ Serial Number_____

Horizontal Timing Information
Note: Horizontal timings may be given in pixel units (if given) or time units.
Horizontal Pixels per Line Displayed_____
Pixel Time or Frequency (optional)_____
Horizontal Total Line Time or Frequency_____
Horizontal Front Porch_____
Horizontal Sync Width_____
Horizontal Back Porch_____

Vertical Timing Information
Note: Vertical timings may be given in line units or time units.
Vertical Lines Displayed_____
Vertical Lines Total or Frequency (Field Rate)_____
Vertical Front Porch_____
Vertical Sync Width_____
Vertical Back Porch_____

Sync Information
Sync Polarity (+ or -): Composite:_____ Horizontal:_____ Vertical:_____

Additional Notes
_____
_____
_____
_____

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3.7 System Management Devices and Functions

The Eclipse3 Extended Features version boards have devices that are specifically intended to assist in system management. These include:

- A National Semiconductor LM75 I^2C temperature sensor located near the Borealis chip provides local temperature measurements. You can obtain the data sheet and collateral information for the LM75 from the technical document section on the Rastergraf web site;
- Three LEDs, which can be driven by system software to alert and/or inform the user. The are controlled by the Borealis Auxiliary Register;
- A 2 Kb I^2C Serial EEPROM which can be used by system software to store data such as serial number and software revision;

In addition, there are features of the Borealis chip that are useful:

- Power management control registers allow various parts of the chip to be put powered down without making the chip entirely useless;
- Signature registers in the RAMDAC can be are used to confirm that a test pattern in display memory will pass correctly through the Borealis all the way to the DAC inputs. This is useful as a Built In Self Test (BIST) function;
- When the board is properly connected to a monitor and a test image is displayed on the monitor, a certain level voltage will be developed at the DAC outputs that drive the monitor. A simple A/D reads the voltage and confirms that the DAC output is above a certain threshold level;
- The I^2C-based DDC2B protocol is used to control the display monitor. DDC2B is a VESA standard (http://www.vesa.org/) which allows the frame buffer to read the Additional Display Identification Data (EDID) from the monitor. The EDID includes resolutions supported, maximum width and refresh, and sync type .
- Frequency select bits for the Borealis Drawing Engine and the programmable Memory Clock PLL allow the system to optimize operating frequencies for the Borealis as a function of system temperature.

Please contact Rastergraf for more information if you wish to utilize any or all of these features.

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3.8 Talk To Me Through I^2C

The Borealis chip has a control register that is used to implement the I^2C protocol, a 2 wire serial bus designed Philips Semiconductor. The Borealis is the I^2C master and it controls the bus through the DDC control register in the Borealis chip. The I^2C bus supports specific “start”, “stop” and “acknowledge” states, so it is possible to probe for these devices and determine whether they exist.

I^2C is used to control the following devices:

Micrel MIC74 8-bit I/O register (optional)
THC63DV164 DVI digital video encoder/transmitter (optional)
LM75 thermal sensor (optional)
AT24C02 2 Kbit serial EEPROM
the Display Monitor

An I^2C device is determined by a combination of device internal bits (bits 4-7) and (usually) three pins that are wired by the board designer (bits 1-3) Bit 0 is used to denote a Read (1) or Write (0) operation.

Because the Eclipse3 board serial EEPROM and the Display Monitor have a common I^2C address (and this is not allowed) there is a 2 way multiplexer on the Borealis board (see Section 3.5) that selects between on-board I^2C devices and the Display Monitor.

The LM75 must be read in 2 byte increments, otherwise it will hang the I^2C bus. Since most vendors combine the R/W bit with the actual I^2C address (e.g. write @ 0x88, read @ 0x89), the following table uses that convention.

Table 3-5 I^2C Device Addresses

Device	R/W	Binary	Hex	I2CMUX
MIC74	W	0100 0000	0x40	x
	R	0100 0001	0x41	x
THC63DV164	W	0111 0000	0x70	1
	R	0111 0001	0x71	1
LM75	W	1001 1100	0x9C	1
	R	1001 1101	0x9D	1
AT24C02	W	1010 1000	0xA8	1
	R	1010 1001	0xA9	1
Display Monitor	W	1010 1000	0xA8	0
	R	1010 1001	0xA9	0

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3.9 DVI Digital Video Output

General Description

The Thine THC63DV164 transmitter uses DVI® Digital technology to support displays ranging from 640 x 480 up to 1280 x 1024 resolutions in a single link interface. As used on the Eclipse3, the THC63DV164 transmitter is connected to the Borealis using the 24-bit mode, one pixel per clock edge interface. The THC63DV164 is programmed though an I^2C slave interface. It supports Receiver and Hot Plug Detection for a variety of power management options. You can obtain the data sheet for the THC63DV164 from the technical document section on the Rastergraf web site

Features

- Scaleable Bandwidth: 25 - 110 Mpixels/sec (VGA to SXGA)
- I^2C Slave Programming Interface
- De-skewing option: varies clock to data timing
- Supports cable length over 5m with twisted pair, fiber-optics ready
- DVI 1.0 compatible

Figure 3-4 THC63DV164 Block Diagram

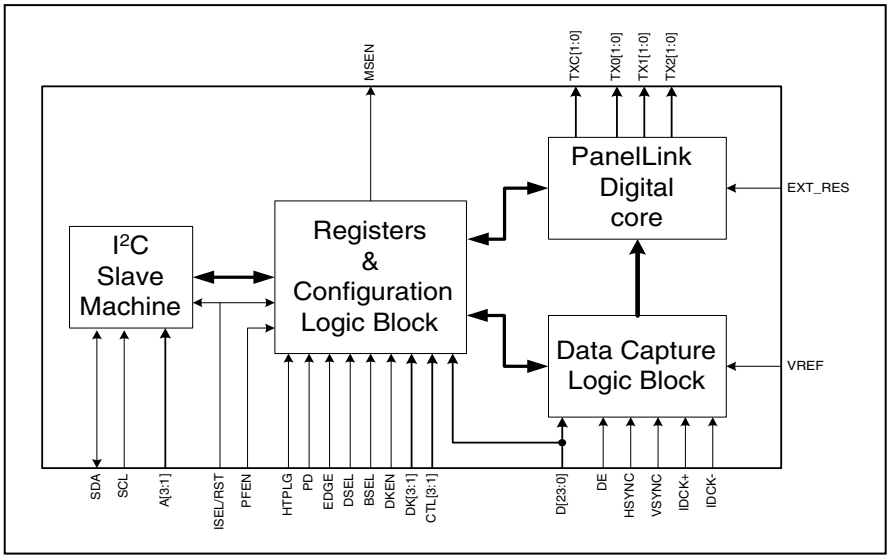

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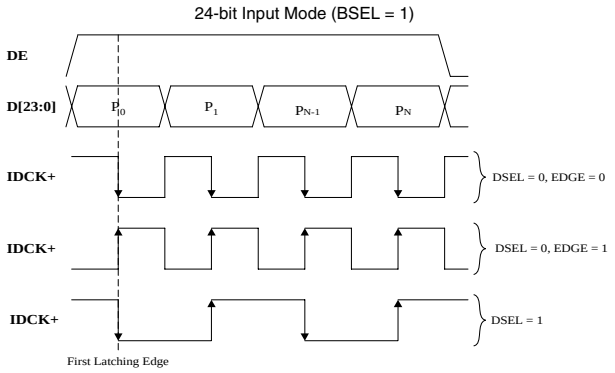
Figure 3-5 THC63DV164 RGB to 24-bit TMDS Mapping Diagram



24-bit Mode Data Mapping[1,2,3]

Pin Name	P0	P1	P2
D23	R0[7]	R1[7]	R2[7]
D22	R0[6]	R1[6]	R2[6]
D21	R0[5]	R1[5]	R2[5]
D20	R0[4]	R1[4]	R2[4]
D19	R0[3]	R1[3]	R2[3]
D18	R0[2]	R1[2]	R2[2]
D17	R0[1]	R1[1]	R2[1]
D16	R0[0]	R1[0]	R2[0]
D15	G0[7]	G1[7]	G2[7]
D14	G0[6]	G1[6]	G2[6]
D13	G0[5]	G1[5]	G2[5]
D12	G0[4]	G1[4]	G2[4]
D11	G0[3]	G1[3]	G2[3]
D10	G0[2]	G1[2]	G2[2]
D9	G0[1]	G1[1]	G2[1]
D8	G0[0]	G1[0]	G2[0]
D7	B0[7]	B1[7]	B2[7]
D6	B0[6]	B1[6]	B2[6]
D5	B0[5]	B1[5]	B2[5]
D4	B0[4]	B1[4]	B2[4]
D3	B0[3]	B1[3]	B2[3]
D2	B0[2]	B1[2]	B2[2]
D1	B0[1]	B1[1]	B2[1]
D0	B0[0]	B1[0]	B2[0]

Notes: [1] In the figure, clock edges represented by arrows signify the latching edge.
[2] Color Pixel Components: R = RED, G = GREEN, B = BLUE
[3] Bit significance within a color: [7:0] = [MSB:LSB]

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3.10 Flash EEPROM

The Eclipse3 has a 128 KB Flash EEPROM. It can be updated in the field using a special updater program. The code in the PROM cannot be directly executed by the CPU. It must be read by the host CPU into its memory and executed from there.

The Borealis accesses the PROM data through the Flash EPROM data port. The multiplexed address bits contain both the high and low order address lines for the PROM. The high order lines appear first and so must be latched externally.

Although in most cases the standard BIOS PROM would be 64 KB, a 128 KB is used on the Eclipse3 in order to accommodate both Windows VGA BIOS and SPARC FCode. See ***Section 2.3.3*** for more information.

3.11 Serial EEPROM

The graphics board includes an IC position for an Atmel AT24C02 (or equivalent) 2 Kb (256 bytes) I^2C Serial Electrically Erasable Programmable Read Only Memory (EEPROM). The programming of the Serial EEPROM is done through control lines on the Borealis chip.

Rastergraf reserves the first 128 bytes of the 256 byte Serial EEPROM for internal use. The remaining 128 bytes are left for user data. The use of the serial EEPROM on the Eclipse3 does not currently have formal Rastergraf software support.

3.12 Interrupts

There is not a lot to say about interrupts for the Eclipse3. The Borealis chip is connected to the INTA line. The interrupt is controlled through the control registers in the chip itself. See ***Section 2.3.2*** for more comments about Interrupts. Note that if the LM75 Temperature Sensor is installed, it too can cause an interrupt on the INTA line.

What happens on that line at the other end (CPU side) is beyond the scope of this manual. In most cases, the interrupts are combined with other PCI slots, and the software will have to poll all PCI devices to see who made the interrupt.

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Chapter 4
Troubleshooting

Introduction

This chapter contains information which should assist you in tracking down installation and functional problems with your board.

4.1 General procedures

4.2 Dealing with the PCI bus

4.3 Maintenance, Warranty, and Service

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4.1 General Procedures

The Eclipse3 boards were designed with reliability and durability in mind. Nevertheless, it may happen that a problem will occur. This section is devoted to aiding the user in tracking down the problem efficiently and quickly.

You may be able to locate minor problems without technical assistance. If the problem can not be remedied, Rastergraf can then issue a Return Material Authorization (RMA) so that the board can be returned to the factory for quick repair.

It can happen that installing a new board will overload the computer's power supply if the power supply margins are exceeded. The first step in ascertaining if this is the problem is to calculate a power supply budget. This involves adding up the power requirements of each board in the system to see if you are within specification. Consult your computer's technical manual for information on how to correctly determine this. A typical Eclipse3 will draw a total of less than 1 amps at +5 and +3.3 Volts.

When attempting to verify that the power supply is working properly, it is not unusual to unplug everything and measure the supply without a load. While this practice is acceptable for linear supplies, switching supplies (which are very commonly used in computers) require a certain load before proper regulation is achieved. Typically, at least 5 Amps must be drawn from the +5 Volt supply before the +12 volt supplies will give the proper readings.

It can also happen that if you build your own cables and you short +5 to ground on the Eclipse3 front panel connector you may trigger the auto-resetting fuse which protect power supply pins when an overload occurs. The fuse resets automatically when an overload is removed.

Note

If the board is not functioning, check that +3.3V is supplied on the host side connectors. The Eclipse3 boards **REQUIRE** both +3.3V and +5V. The PMC and PCI boards can be supplied with a local +3.3V regulator, so if there is no way to supply +3.3V on the backplane, there is a way out. Please contact Rastergraf if you need to do this.

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4.2 Dealing with the PCI Bus

Because of the nature of the PCI protocol and the way support has been implemented in the Operating Systems for PCI bus devices such as the Eclipse3, it is not possible to follow the same debugging strategies.

In fact, there are no address jumpers for these boards. Everything is configured in software through a set of on-board registers, which control the characteristics of the board as required by the PCI Specification.

The information used to program these registers is supplied to Operating System (OS) specific functions by Rastergraf ’s software. Ordinarily, several address map translations occur, including the CPU physical and virtual address maps and the CPU to PCI bridge address map.

While x86 systems generally follow the standards required to meet PC compatibility and mask these details, PowerPC systems do not. Among PowerPC vendors, there are no standards which ensure interoperability among CPU boards, even when they use the same CPU and PCI bridge.

Therefore, if you plan to use an Eclipse3 graphics board in a PowerPC based system, it is vital to ensure that Rastergraf can vouch for the board’s operation before you order the board. Otherwise, you may go crazy trying to figure out why it doesn’t work. Please contact us (support@rastergraf.com or 541-923-5530) if you have problems.

4.3 Maintenance, Warranty, and Service

Maintenance

The Eclipse3 requires no regular service, but if used in a particularly dirty environment, periodic cleaning with dry compressed air is recommended.

Because of the heat generated by normal operation of the graphics board and other boards in the system, forced crossflow ventilation is required. If forced ventilation is not used IC temperatures can rise to 60 degrees C or higher. Such high temperature operation causes IC failures and reduced MTBF. With proper forced air cooling IC temperatures will be less than 35 degrees C.

Warranty

The Eclipse3 graphics boards are warranted to be free from defects in material or manufacture for a period of 12 months from date of shipment from the factory. Rastergraf ’s obligation under this warranty is limited to replacing or repairing (at its option) any board which is returned to the factory within this warranty period and is found by Rastergraf to be

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defective in proper usage. This warranty does not apply to modules which have been subjected to mechanical abuse, electrical abuse, overheating, or other improper usage. This warranty is made in lieu of all other warranties expressed or implied. **All warranty repair work will be done at the Rastergraf factory.**

Return Policy

Before returning a module the customer must first request a Return Material Authorization (RMA) number from the factory. The RMA number must be enclosed with the module when it is packed for shipment. A written description of the trouble should also be included.

Customer should prepay shipping charges to the factory. Rastergraf will prepay return shipping charges to the customer. Repair work is normally done within ten working days from receipt of module.

Out of Warranty Service

Factory service is available for modules which are out of warranty or which have sustained damage making them ineligible for warranty repair. A flat fee will be charged for normal repairs and must be covered by a valid purchase order. If extensive repairs are required, Rastergraf will request authorization for an estimated time and materials charge. If replacement is required, additional authorization will be requested.

All repair work will be done at the Rastergraf factory in Redmond, Oregon, unless otherwise designated by Rastergraf.

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